



**AMENDED
(7TH DECEMBER 2009)
FLORA AND FAUNA ASSESSMENT
FOR
LOTS 2 & 3 DP 244652
URLIUP ROAD
BILAMBIL**

DECEMBER 2009

**A REPORT PREPARED TO
PLATEAU NOMINEES PTY LIMITED**

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1 INTRODUCTION

1.1 Background

James Warren and Associates (JWA) have been engaged by Plateau Nominees Pty Ltd complete a Flora and Fauna Assessment for land at Lots 2 & 3 DP 244652, Uriup Road, Bilambil.

The assessment has involved the following:

- Mapping and ground truthing vegetation units and determining their conservation status with reference to the Comprehensive Regional Assessment completed for NSW Forest and Non-forest ecosystems as part of the Regional Forestry Agreement (RFA) process (CRA Unit 1999), and with reference to the Tweed Vegetation Management Strategy (2004);
- Searching for and recording Threatened (*TSC Act 1995*), ROTAP (Briggs & Leigh 1996) and regionally significant plant species (Sheringham & Westaway 1995), and assessing the occurrence of Endangered Ecological Communities (EECs);
- Determining the suite of Threatened fauna (*TSC Act 1995*) that occurs in the locality and assessing their potential occurrence in the Study area;
- Assessing habitat provided by the site in relation to adjacent habitat and making an assessment of the corridor value of the site;
- Addressing statutory requirements including *State Environmental Planning Policy No. 44* (SEPP 44 - Koala Habitat Protection), Section 5A of the *Environmental Planning & Assessment Act (1979)* (EPA Act) and the *Commonwealth Environment Protection and Biodiversity Act 1999* (EPBC Act).

1.2 Locality

1.2.1 Introduction

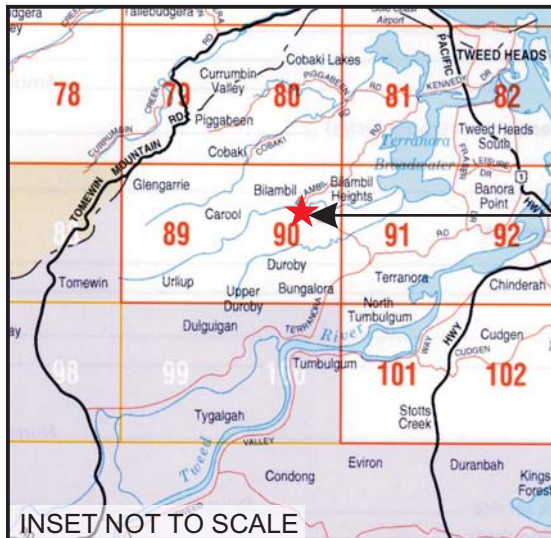
The Locality is defined as the area within a 10km radius of the Subject Site and extends from Duranbah in the south to Palm Beach in the north and from Upper Currumbin in the west to Fingal Head in the east (**FIGURE 1**).

Prominent features in the locality include the southern suburbs of the Gold Coast as far north as Palm Beach, the townships of Coolangatta, Tweed Heads, Tumbulgum, Banora Point and Terranora and the villages of Bilambil, Chinderah, Glengarrie and Piggabeen. Major water bodies include the adjacent Bilambil Creek, Cobaki and Terranora Broadwaters and the Tweed River and tributaries.

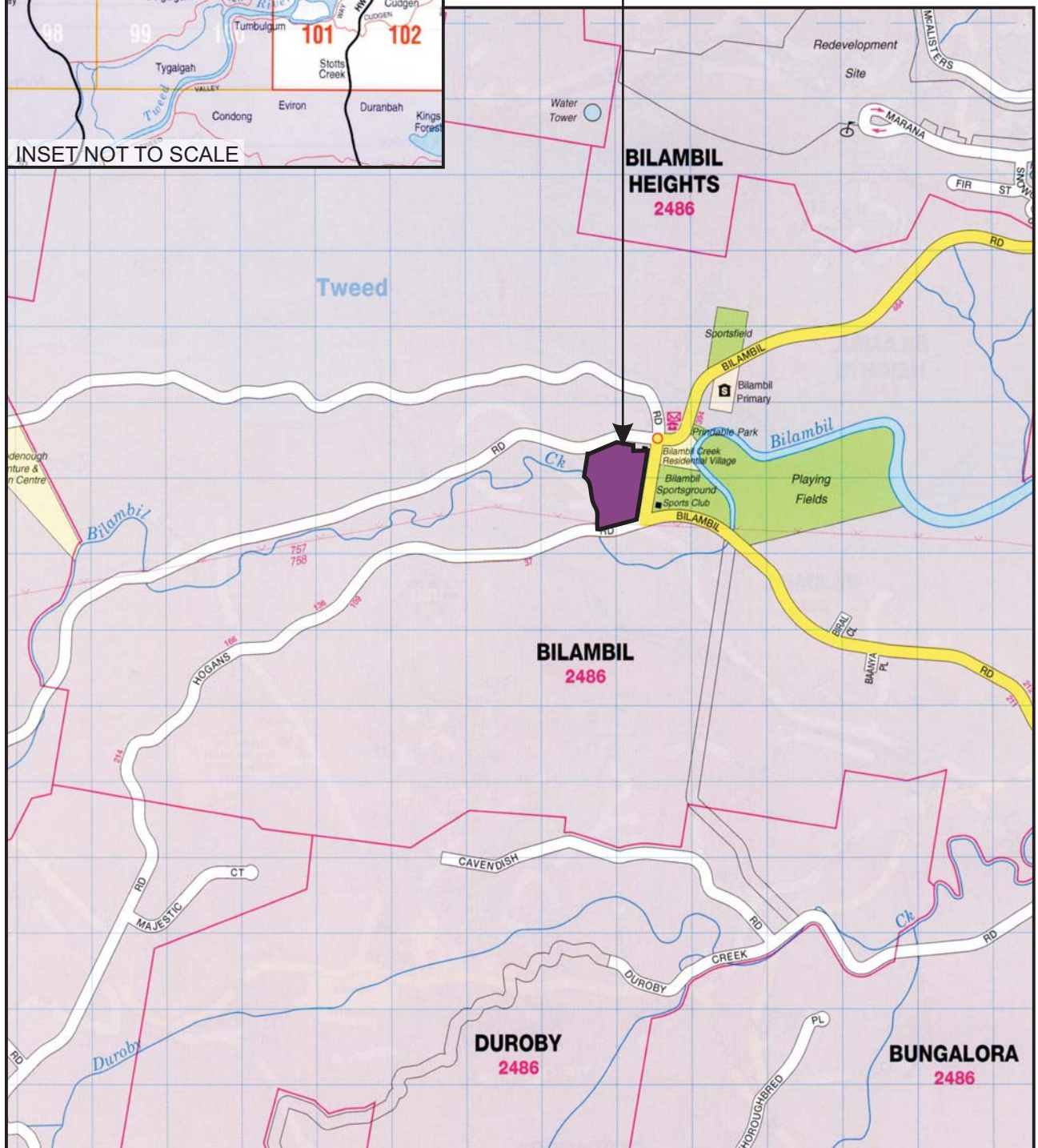
Dominant habitat types are freshwater creeks, eucalypt forest, rainforest, degraded farmland and intertidal communities. Land uses within the locality include forestry, conservation, tourism, residential, commercial, and grazing and agriculture.

There are five (5) dedicated conservation reserves in the locality:

- Nicoll Scrub National Park, an area of 27 hectares to the north;
- Currumbin Hill Conservation Park, an area of 4 hectares also to the north;
- Stotts Island Nature Reserve, an area of 142 hectares to the south-east;
- Tweed Estuary Nature Reserve, an area of 59 hectares to the east; and



SUBJECT SITE



0 500m

SOURCE: Brisbane UBD

SCALE: 1 : 20 000 @ A4

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Tweed Shire Council LGA

FIGURE 1

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TITLE

**LOCALITY
PLAN**



- Ukerebagh Nature Reserve, an area of 150 hectares to the east.

State Environmental Planning Policy (SEPP) No. 14 Coastal Wetlands 1 - 42 occur within 10km of the locality (**FIGURE 2**).

1.2.2 The Subject Site

The site consists of land described as Lots 2 & 3 DP 244652, Uriup Road, Bilambil and covers an area of approximately 4.5 hectares adjacent to Bilambil Creek.

The Subject Site was previously used as a quarry which has resulted in the removal of most of the native vegetation. The site is highly disturbed and infested with exotic weeds. Some patches of forested vegetation occur along the property boundaries. The riparian zone is dominated by Camphor laurel but some elements of riparian rainforest vegetation remain. It appears that the abandoned quarry site is currently used as an unofficial bike track for local youths.

The site is surrounded by sports fields to the east, the village of Bilambil to the north, Bilambil Creek to the west and cleared grazing land to the south (**FIGURE 3**).

1.2.3 The Study Area

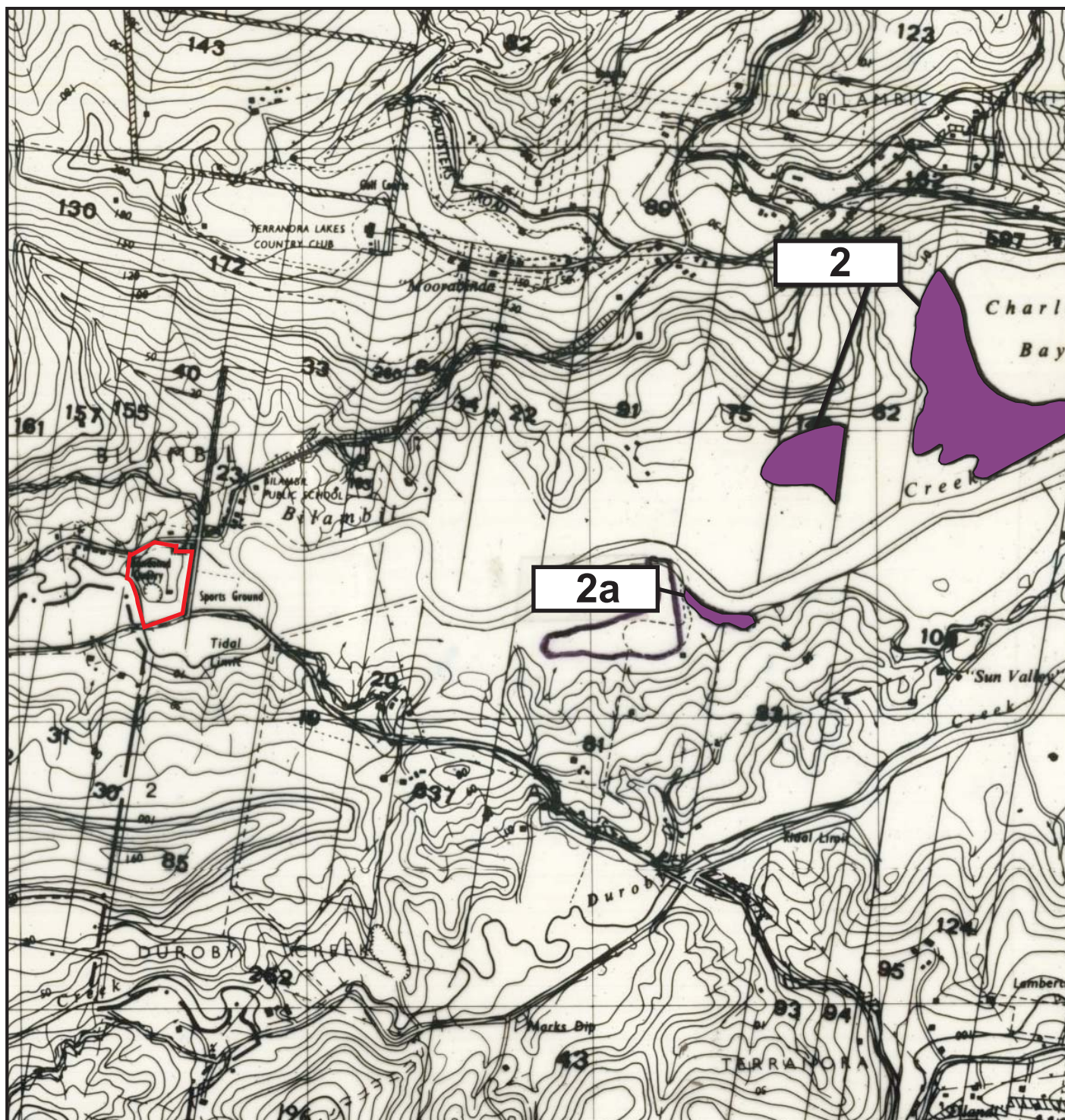
The Study Area is defined as the Subject Site together with any proximate areas that may be affected by the proposed development. The Study Area for this assessment includes the adjacent section of Bilambil Creek.



1.3 Landuse Zones

The Subject Site is zoned 2(d) Village (**FIGURE 4**; Ecograph 2004).

1.4 The Proposed Development

The Proposed development consists of fifty-two (52) residential Lots, a commercial development, open space, drainage reserves and roads. Residential Lots will comprise the majority of the site. Open and commercial space, and roads will make up the balance of the property (**FIGURE 5**).



Legend
 SEPP No.14
 Subject Site



0 500m

SOURCE: NSW State Environmental Planning
Policy No. 14 Coastal Wetlands (Amendment 14)
SCALE: 1 : 20 000 @ A4

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FIGURE 2

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TITLE

**SEPP No. 14
COASTAL
WETLANDS**



Legend
 Subject Site



0 50m

SOURCE: Google Earth 2008 Aerial Photograph

SCALE: 1 : 2000 @ A4

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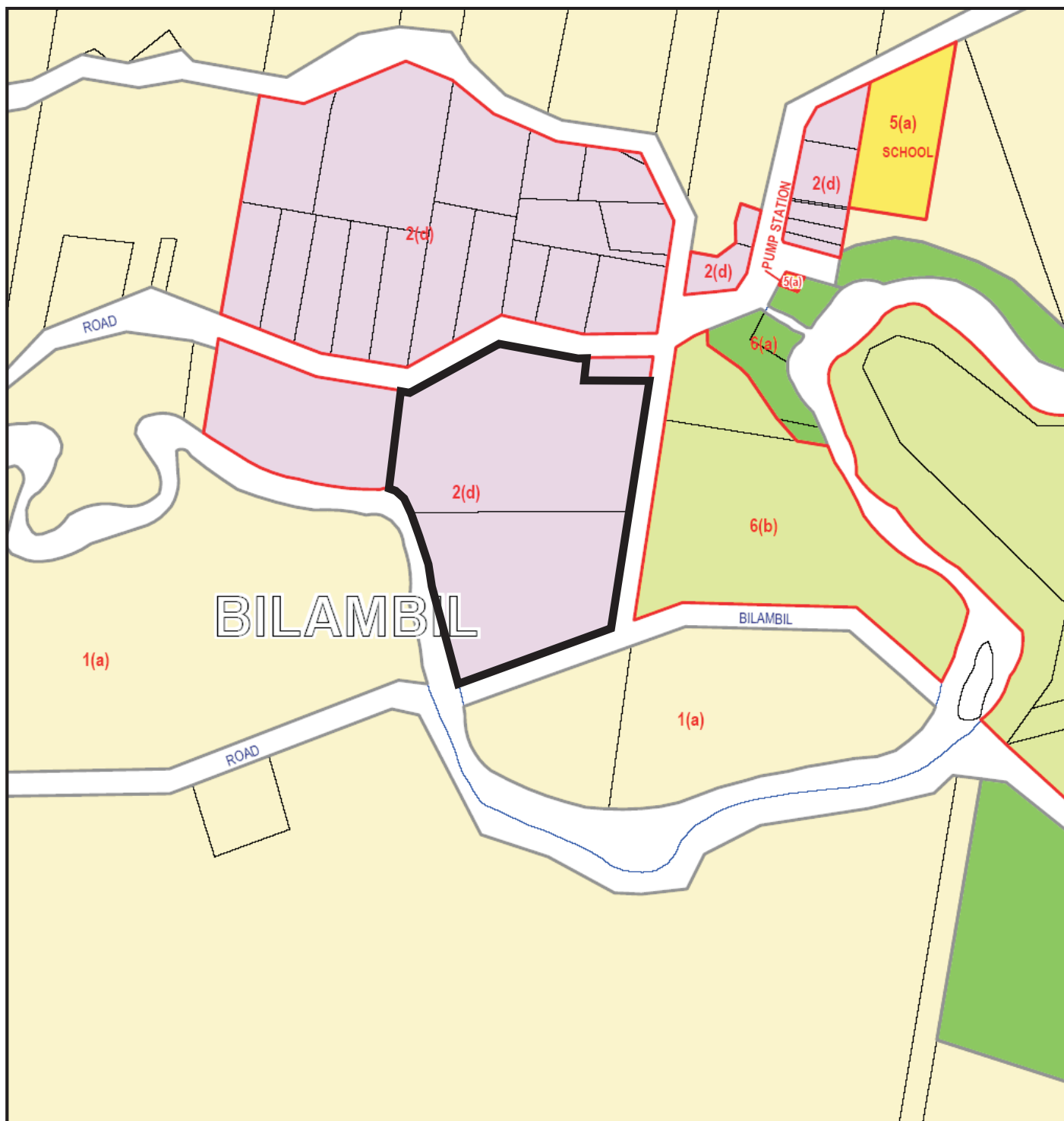
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FIGURE 3

PREPARED: BW
 DATE: 25 November 2009
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TITLE

**AERIAL
 PHOTOGRAPH**



Legend

- 1. Rural
- 1(a) 1(a) Rural
- 2. Residential
- 2(d) 2(d) Village
- 5. Special Uses
- 5(a) 5(a) Special Uses
- 6. Open Space
- 6(a) 6(a) Open Space
- 6(b) 6(b) Recreation
- Subject Site

0 150m



SOURCE: Tweed Local Environmental Plan 2000

SCALE: 1 : 5000 @ A4

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FIGURE 4

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TITLE

**ZONING
PLAN**



2 FLORA ASSESSMENT

2.1 Introduction

This section discusses the methods used in the vegetation assessment and presents the results.

2.2 Methods

2.2.1 NPWS Database Search

Searches of the NPWS (DECC 2008) and EPBC (DEWHA 2008) databases were completed (May 2008) to find records of State and Commonwealth Threatened species¹ within 10km of the Subject Site.

2.2.2 Site Survey

A survey was completed on the 29th April 2008 by two (2) scientists utilising random meander searches (Cropper 1993) for a total of four (4) hours. A plant species list was compiled (APPENDIX 1).

Mapping of vegetation communities was achieved using 1:1000 (2005) aerial photography, GPS and cadastral bases with relevant survey points.

2.3 Results

2.3.1 NPWS Database Search

Searches of the NPWS and EPBC databases revealed thirty-one (31) significant flora species within 10km of the Subject Site (TABLE 1).

TABLE 1
RECORDS OF SIGNIFICANT FLORA SPECIES WITHIN 10 KM OF THE SUBJECT SITE

Common name	Botanical name	Status	
		TSC Act*	EPBC Act#
Arrow-head vine	<i>Tinospora tinoporoides</i>	V	V
Axe breaker	<i>Geijera paniculata</i>	E	-
Brush cassia	<i>Cassia brewsteri</i> var. <i>marksiana</i>	E	-
Coolamon	<i>Syzygium moorei</i>	V	V
Corokia	<i>Corokia whiteana</i>	V	V
Crystal Creek walnut	<i>Endiandra floydii</i>	E	E
Davidson' Plum	<i>Davidsonia jerseyana</i>	E	E
Fine-leaved tuckeroo	<i>Lepiderema pulchella</i>	V	-
Hairy-joint grass	<i>Arthraxon hispidus</i>	V	V
Heart-leaved bosistoa	<i>Bosistoa selwynii</i>		V
Lesser swamp-orchid	<i>Phalus australis</i>		E
Marblewood	<i>Acacia bakeri</i>	V	-
Queensland xylosma	<i>Xylosma terrae-reginae</i>	E	-
Red lilly pilly	<i>Syzygium hodgkinsoniae</i>	V	V
Red-fruited ebony	<i>Diospyros mabacea</i>	E	E
Red bobble nut	<i>Hicksbeachia pinnatifolia</i>		V
Rough-shelled bush nut	<i>Macadamia tetraphylla</i>	V	V
Rusty plum	<i>Amorphospermum whitei</i>	V	-
Rusty rose walnut	<i>Endiandra hayesii</i>	V	V
Scented acronychia	<i>Acronychia littoralis</i>	E	E

¹ As listed within schedules of the TSC Act (1995) and EPBC Act (1999).



Flora and Fauna Assessment

Small-leaved hazelwood	<i>Symplocos baeuerlenii</i>	V	V
Small-leaved tamarind	<i>Diploglottis campbellii</i>	E	E
Smooth Davidson's Plum	<i>Davidsonia johnsonii</i>	E	E
Southern fontainea	<i>Fontainea australis</i>	V	V
Southern ochrosia	<i>Ochrosia moorei</i>	E	E
Spiny gardenia	<i>Randia moorei</i>	E	E
Stinking cryptocarya	<i>Cryptocarya foetida</i>	V	V
Sweet myrtle	<i>Gossia fragrantissima</i>	E	E
Thorny pea	<i>Desmodium acanthocladum</i>		V
Yellow satinheart	<i>Bosistoa transversa</i>	V	V
Yiel yiel	<i>Grevillea hilliana</i>	E	-

* E or V is Endangered or Vulnerable under the TSC Act 1995.

E, V or R is Endangered, Vulnerable or Rare under the EPBC Act 1999.

2.3.2 Site Survey

The survey recorded the following:

- Five (5) vegetation communities (Section 2.3.3; **FIGURE 6**);
- Ninety-five (95) flora species (APPENDIX 1);
- One (1) threatened species. The Rough-shelled bush nut (*Macadamia tetraphylla*) is listed as Vulnerable under the NSW *Threatened Species Conservation Act* (1974) and the *Environment Protection and Biodiversity Conservation Act* (1999); and
- One (1) regionally significant species (Sheringham & Westaway 1995; White fig or *Ficus virens*).

2.3.3 Community Descriptions

Five (5) vegetation communities were recorded (**TABLE 2**). A description of these is provided (Sections 2.3.3.1 to 2.3.3.5). The conservation status is discussed with reference to the Comprehensive Regional Assessment (CRA) completed for NSW Forest and Non-forest ecosystems as part of the Regional Forestry Agreement (RFA) process (CRA Unit 1999). The RFA establishes the framework for the management of the forests of upper north-east and lower north-east regions. The RFA document sets out percentage reservation status of forest and non-forest Ecosystems in the Comprehensive, Adequate and Representative (CAR) Reserve System based on vegetation modelling to establish the pre-1750 extent of forest ecosystems in the region.

Vegetation communities are also described at a local level with reference to the Tweed Vegetation Management Strategy (TVMS) (Ecograph 2004).



TABLE 2
VEGETATION COMMUNITIES PRESENT ON THE SUBJECT SITE

1	Tall Closed Forest (<i>Cinnamomum camphora</i> ± mixed Rainforest species.)
2	Mid-high Open Forest (<i>Cinnamomum camphora</i>)
3	Low Open Woodland (<i>Acacia melanoxylon</i>)
4	Mid-high Open Forest (<i>Jagera pseudorhus</i>)
5	Low Closed Herbland (Mixed weed species.)

2.3.3.1 Community 1 - Tall Closed Forest (*Cinnamomum camphora* ± mixed Rainforest species)

Location and area

Community 1 occurs along the eastern boundary of the Subject Site, flanking Bilambil Creek and covers an area of 366 m².

Description

The canopy is dominated by Camphor laurel between ten (10) - fifteen (15) metres high. Other species occurring include Blue quandong and Weeping lilly pilly, Brown kurrajong, Foambark, Guioa and Bloodvine.

The mid-storey contains Camphor laurel and various rainforest species such as Weeping lilly pilly, Red kamala, Foambark, Sandpaper fig, Hairy pittosporum, Hard quandong, Sweet pittosporum, Macaranga, Guioa, and Blackwood wattle. Some weed species also occur including Coral tree, Umbrella tree, Mickey mouse plant, Winter senna and Chinese burr.

The ground cover is dominated by Mat rush. Other natives occurring are Cunjevoi, Birdnest fern, Basket grass, Blue flax lilly and Maiden hair fern. Weed species include Camphor laurel seedlings, Mist flower, Singapore daisy, Parramatta grass and Mickey mouse plant.

Conservation status.

The closest analogue to this community, considered in the RFA report, is Forest Ecosystem 201 (Camphor laurel). The RFA document does not provide any data on the distribution or conservation status of this Forest Ecosystem within the North Coast Bioregion.

The TVMS (Ecograph 2004) describes this ecosystem as, Highly modified/ Disturbed - 1004 Camphor laurel dominant, closed to open forest. Ecosystem 1004 covers:

- 3642 hectares of the Shire (i.e. 2.77%); and
- 5.31 % of the vegetated land within the Shire.

The conservation status of Community 1 is considered low due to the dominance of Camphor laurel, the presence of other exotic species and the low species diversity.

2.3.3.2 Community 2 - Mid-high Open Forest (*Cinnamomum camphora*)

Location and area

Community 2 occurs as two (2) elongated patches along the fence lines of Uriup and Bilambil Roads and covers an area of 0.2 hectares.



Description

The canopy is dominated by Camphor laurel to about ten (10) metres. The mid-story contains Camphor laurel and rainforest pioneer species including Red Kamala, Macaranga, Guioa, Foambark and Blackwood wattle. Weed species occurring are Large leaved privet, Umbrella tree, Lantana, Celtis, Cocos palm, Smooth senna, Guava, Mickey mouse plant, Winter senna and Chinese burr. The vines Siratro, Dutchman's pipe and Silver-leaved desmodium also occur.

The ground cover within this community is dominated by Mistflower, Broad leaved Paspalum, Molasses grass, Singapore daisy, Crofton weed, regenerating Camphor laurel, Parramatta grass and Mickey mouse plant.

Conservation status.

The closest analogue to this community considered in the RFA report is Forest Ecosystem 201 (Camphor laurel). The RFA document does not provide any data on the on the distribution or conservation status of this Forest Ecosystem within the North Coast Bioregion.

The TVMS (Ecograph 2004) describes this ecosystem as, Highly modified/ Disturbed - 1004 Camphor laurel dominant, closed to open forest. Ecosystem 1004 covers:

- 3642 hectares of the Shire (i.e. 2.77%); and
- 5.31 % of the vegetated land within the Shire.

The conservation status of Community 2 is considered low due to the dominance of Camphor laurel, the presence of other exotic species and the low species diversity.

2.3.3.3 Community 3 - Low Open Woodland (*Acacia melanoxylon*)

Location and area

Community 3 occurs as two (2) small patches in the centre of Subject Site and covers an area of 397 m².

Description

The canopy is dominated by Blackwood wattles approximately four (4) - six (6) metres high. The native vine Silk-pod occurs in the canopy. A mid-storey is absent and the ground cover vegetation is comprised of Broad-leaved paspalum, Mist flower, Lantana, Silver leaved desmodium and Singapore daisy. Large boulders, bare rock and dead leaves are also present.

Conservation status

The most appropriate CRA classification for this community is FE 151 Wattle. The RFA document does not provide any data on the on the distribution or conservation status of this Forest Ecosystem within the North Coast Bioregion.

The TVMS (Ecograph 2004) describes this ecosystem as Sclerophyll forests/woodlands on sand substrates and alluvium - 311 Coastal Acacia Communities and provides the following data:

- Ecosystem 311 covers approximately 20 hectares which is 0.03% of the mapped bushland in the Shire.



The conservation value of this community is considered to be low, due to its small size and low diversity.

2.3.3.4 Community 4 - Mid-high Open Forest (*Jagera pseudorhus*)

Location and area

This community occurs approximately in the centre of the Subject Site around one (1) large Foambark.

Description

Community 4 occurs around an old growth Foam bark. There are a few regenerating native species such as a White fig, Red kamala, Brush cherry, Guioa and one (1) stem of the threatened species Rough-shelled bush nut (*Macadamia tetraphylla*). The ground cover consists of the weeds, grasses and herbs that occur across the majority of the site.

Significant species.

Community 4 includes the following significant species (**FIGURE 6**):

- Rough-shelled bush nut (*Macadamia tetraphylla*) TSC 1995; and
- White fig (*Ficus virens*) (Sheringham & Westaway 1995).

Conservation status

The most appropriate CRA classification for this community is Forest Ecosystem 168 (Rainforest) (CRA Unit 1999). It must be noted that the CRA report (1999) does not provide a more detailed categorisation of rainforest (e.g. Littoral rainforest). The document provides the following data on Forest Ecosystem 168:

- 159211 hectares of this ecosystem remains within the upper north-east section of the NSW North Coast Bioregion. The original extent (*i.e.* Pre 1750) has not been calculated;
- The extent present in the CAR reserve system has not been determined;
- The ecosystem is considered to be **Endangered**; and
- Rainforest communities have been identified as a priority for conservation on private land.

The TVMS (Ecograph 2004) classifies this vegetation type as 102 Sub-tropical/Warm Temperate Rainforest on bedrock substrates and provides the following data:

- Ecosystem 102 is considered endangered but adequately conserved within the Tweed Shire; and
- Is listed as having a NPWS private lands conservation priority.

The conservation value of this very small rainforest community is considered to be low - moderate. JWA have completed a Translocation Plan for the threatened Rough-shelled bush nut found within this community (JWA 2009a).

2.3.3.5 Community 5 - Low Closed Herbland with Scattered trees (Mixed exotic weed species)

Location and area

Community 5 occurs over the majority of the Subject Site covering 4.3 hectares.



Legend

- Community 1: Tall Closed Forest (*Cinnamomum camphora* +/- Mixed rainforest species)
- Community 2: Mid-high Open Forest (*Cinnamomum camphora*)
- Community 3: Low Open Woodland (*Acacia melanoxylon*)
- Community 4: Mid-high Open Forest (*Jagera pseudorhus*)
- Community 5: Low Closed Herbland (Mixed weed species)
- Rough-shelled bush nut (*Macadamia tetraphylla*)
- Subject Site

0 50m



SOURCE: JWA Site Investigations;
Google Earth 2008 Aerial Photograph

SCALE: 1 : 2000 @ A4

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FIGURE 6

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TITLE

**VEGETATION
COMMUNITIES**



Description

The vegetation within this community consists of mostly exotic weeds including, Blue billy goat weed, Annual ragweed, Crofton weed, Lantana, Rattlepod, Stinking rodger, Chinese burr, Groundsel, Molasses grass, Castor oil plant, Singapore daisy, Cotton bush, Coastal morning glory, Winter senna, Farmers friends, Silver leaved desmodium, Madeira vine and Foxtail grass. Camphor laurel and Slash pines are scattered throughout and very few native species are present.

Conservation status

There is no appropriate CRA classification for this community. The highly modified condition and dominance of the exotic species results in a low conservation value.



3 FAUNA ASSESSMENT

3.1 Introduction

This section includes a description of the methods used for assessing which fauna occurrence in the Study Area and a discussion of the results.

3.2 Methods

3.2.1 NPWS Database Search

Searches of the NPWS (DECC 2008) and EPBC (DEWHA 2008) databases were completed (May 2008) to find records of State and Commonwealth Threatened species² within 10km of the Subject Site.

3.2.2 Literature Review

A comprehensive literature review was completed, using a number of sources, to identify records of Threatened species in the locality.

3.2.3 Habitat Assessment

Site habitats were assessed, during the flora survey, to determine their value for native fauna species. The assessment focused on identifying habitat features associated with Threatened species as well as other native fauna groups. Particular attention was paid to features such as:

- Mature trees with hollows, fissures and/or other suitable roosting/nesting places;
- Koala food trees;
- Preferred Glossy black cockatoo feed trees such as Forest oak or Black she-oak;
- Yellow-bellied glider feeding scars;
- Condition, flow and water quality of drainage lines and bodies of water;
- Dense vegetation;
- Hollow logs/debris and areas of dense leaf litter;
- Blossoming and Fruiting flora species particularly winter-flowering;
- Caves and man-made structures suitable as microchiropteran bat roost sites; and
- Vegetation connectivity and proximity to neighbouring areas of intact vegetation.

3.2.4 Fauna Survey

3.2.4.1 Introduction

A fauna survey was carried out, in conjunction with the flora survey, by two (2) scientists on the 3rd of May 2008. The weather was generally fine and warm.

The following survey techniques were utilised in this assessment:

- **Opportunistic Sightings** - The 'random meander' technique was used to traverse the site. All sightings of fauna utilising the Study Area were recorded.
- **Active Searching** - Logs, sheets of tin, cardboard, bark and leaves were overturned in search of reptiles and amphibians. Diggings, scats, bones and bird activity was also noted.

² As listed within schedules of the *TSC Act (1995)* and *EPBC Act (1999)*.



3.3 Results and Discussion

3.3.1 NPWS Database Search

The results of the NPWS (DECC 2008) and EPBC (DEWHA 2008) databases are shown below (TABLE 3).

TABLE 3
THREATENED FAUNA SPECIES RECORDED
WITHIN 10 KM OF THE SUBJECT SITE

Common Name	Scientific Name
Albert's lyrebird	<i>Menura alberti</i>
Barred cuckoo-shrike	<i>Coracina lineata</i>
Beccari's free-tail bat	<i>Mormopterus beccarii</i>
Black flying-fox	<i>Pteropus alecto</i>
Black-necked stork	<i>Ephippiorhynchus asiaticus</i>
Bush-hen	<i>Amaurornis olivacea</i>
Bush stone-curlew	<i>Burhinus grallarius</i>
Collared kingfisher	<i>Todiramphus chloris</i>
Comb-crested jacana	<i>Irediparra gallinacea</i>
Common planigale	<i>Planigale maculata</i>
Eastern bent-wing bat	<i>Miniopterus schreibersii oceanensis</i>
Eastern free-tail bat	<i>Mormopterus norfolkensis</i>
Eastern long-eared bat	<i>Nyctophilus bifax</i>
Glossy black-cockatoo	<i>Calyptorhynchus lathamii</i>
Greater broad-nosed bat	<i>Scoteanax rueppellii</i>
Greater sand plover	<i>Charadrius leschenaultii</i>
Green-thighed frog	<i>Litoria brevipalmata</i>
Grey-headed flying-fox	<i>Pteropus poliocephalus</i>
Koala	<i>Phascolarctos cinereus</i>
Large-footed myotis	<i>Myotis macropus</i>
Little bent-wing bat	<i>Miniopterus australis</i>
Little tern	<i>Sterna albifrons</i>
Long-nosed potoroo	<i>Potorous tridactylus</i>
Magpie goose	<i>Anseranas semipalmata</i>
Mangrove honeyeater	<i>Lichenostomus fasciolaris</i>
Masked owl	<i>Tyto novaehollandiae</i>
Mitchell's rainforest snail	<i>Thersites mitchellae</i>
Osprey	<i>Pandion haliaetus</i>
Pied oystercatcher	<i>Haematopus longirostris</i>
Rose-crowned fruit dove	<i>Ptilinopus regina</i>
Sooty owl	<i>Tyto tenebricosa</i>
Spotted-tail quoll	<i>Dasyurus maculatus</i>
Square-tailed kite	<i>Lophoictinia isura</i>
Terek sandpiper	<i>Xenus cinereus</i>
Wallum froglet	<i>Crinia tinnula</i>
White-eared monarch	<i>Monarcha leucotis</i>
Wompoo fruit-dove	<i>Ptilinopus magnificus</i>



3.3.2 Habitat Assessment

3.3.2.1 Amphibians

Amphibians occurring in the region are poikilothermic, predominantly insectivorous and generally require free water for reproduction, with the exception of two highland genera (*Assa darlingtoni* and *Philoria* spp.) The habitat requirements of most species are unlikely to be determined by forest cover or floristics, but are more strongly influenced by factors such as climate, distance to water bodies, riparian vegetation, hydrological and morphological characteristics of water bodies and the availability of suitable micro-habitat for aestivation and shelter.

The majority of species that occur within the region lay eggs in or near temporary or permanent water bodies and rely on free water for larval development and metamorphosis. Of these species, only a few are dependent on forested habitats beyond the riparian zone or beyond areas of temporary inundation. These species include the Red-eyed tree frog (*Litoria chloris*), Leseuer's frog (*Litoria leseueri*), Fletcher's frog (*Lechriodus fletcheri*) and the Barred frogs of the *Mixophyes* genus.

The Subject Site is likely to provide moderate habitat for a range of frogs. The Bilambil Creek provides rocky areas with Matrushes and areas of moderately deep leaf litter for shelter.

Grasslands and herb fields provide suitable habitat for a range of Amphibian species, particularly along drainage depressions and soaks. Species commonly encountered in grassland communities include the Common eastern froglet, Eastern sign bearing froglet, Striped marsh frog, Spotted grass frog, Eastern dwarf tree frog, Rocket frog and Cane toad are considered as potentially occurring.

Species typically encountered in or adjacent to Closed Forests include the Eastern dwarf tree frog, Red-eyed tree frog, Striped marsh frog, Cane toad and Dainty green tree frog. Relatively few species occur in conjunction with Closed Forest types when permanent water is absent. Species which typically occur in low elevation Rainforest and permanent streams such as the Giant barred frog (*Mixophyes iteratus*) are unlikely to occur at the study site.

3.3.2.2 Reptiles

As reptiles are poikilothermic, and predominantly insectivorous or carnivorous, their habitat requirements are less directly determined by vegetation species composition than other taxa which feed directly on plants. Reptile distributions are strongly influenced by structural characteristics of the vegetation, climate and other factors affecting thermoregulation such as shade and availability of shelter and basking sites (Smith *et al* 1994).

In a survey of the moist forest herpetofauna of North-eastern NSW, Smith *et al* (1989) found that few species discriminated between rainforest and wet sclerophyll forest, however, most species exhibited a response to differences in elevation and the availability of microhabitat components and other substrates.

The availability of microhabitats, of varying thermal properties is particularly important for most reptile species, as behavioural thermoregulation (regulation of body heat) is important in controlling critical body functions such as digestion, foraging activity and reproduction.



Reptile diversity and abundance is often (but not always) significantly higher in drier habitat types, particularly those with a wide variety of ground substrate microhabitats. This contrasts markedly with the distribution patterns of birds, and most mammals.

The single limiting factor in terms of species diversity in coastal vegetation is the lack of shelter sites (eg. logs, tree hollows and decorticated bark). Such habitat components characterise eucalypt forests and woodlands, where species diversity may be much higher, depending on disturbance factors.

The Subject Site is considered to provide moderate quality habitat for reptiles around the Bilambil Creek due to the presence of: the combination of shelter and basking sites; rocky areas and fallen logs for shelter; availability of water.

3.3.2.3 Birds

The significance of near coastal environments of the N.S.W. Far North Coast and South-East Queensland as over-wintering habitat for migratory birds has been established by many observers and bird banders including Keast (1968), Robertson (1973), Gravatt (1974), Porter (1982) and Robertson and Woodall (1983). These patterns may be attributable to the relatively high winter temperatures and long growing season of this region compared with the rest of south-eastern Australia (Fitzpatrick and Nix 1973; Edwards 1979; Nix 1982; Specht *et al* 1981).

Many insectivorous birds from higher latitudes and elevation over-winter in the locality. These include species such as the Fantail cuckoo, Sacred kingfisher, Rainbow bee-eater, Noisy pitta, Tree martin, Black-faced cuckoo-shrike, Cicada bird, Golden whistler, Rufous whistler, Rose robin, Grey fantail, White-throated gerygone, Silvereye, Olive-backed oriole and Spangled drongo.

Birds such as honeyeaters and lorikeets are Blossom nomads (*ibid.*). These birds move locally in response to variation in the availability of nectar and or pollen, important components in their diet. Porter (1982) highlights the importance of Forest red gum, Broad-leaved paperbark and Coast banksia for Scaly-breasted and Rainbow lorikeets as these species flower during the lorikeet's winter breeding period. A sequence of important nectar bearing plants in the genera Eucalyptus, Banksia, Melaleuca and Callistemon provide a continuity of food for nectarivorous birds.

Studies of bird usage in rainforest remnants by Holmes (1987), Connelly and Specht (1988) and Lott & Duigan (1993) indicate that the diversity and abundance of birds is related to the size of the Rainforest patches and their degree of isolation from major areas of native forest. Lott & Duigan (1993) and Howe *et al* (1981) also note that sites with a higher diversity of vegetation and those which are closer to water generally support a greater diversity of birds. Locally nomadic and migratory rainforest species such as the Wompoo, Rose-crowned and Superb fruit-doves, Common koel and Black-faced cuckoo-shrike are known to use scattered areas of habitat as "stepping-stones" between more intact areas of forest (Date *et al* 1992; Lott & Duigan 1993).

The site provides a low diversity of fruiting species. The Subject Site and adjacent areas of vegetation represent a moderate quality habitat for frugivorous birds.

There is a lack of trees with hollows necessary for hollow-nesting birds, however, the Study area may provide some important forage habitat for hollow-dependent avifauna breeding in the forests in the locality.



3.3.2.4 Mammals

Small terrestrial mammals generally occur in highest densities in association with a complex vegetation structure. A dense understorey layer, which provides shelter from predators and provides nesting opportunities, is particularly important.

In general medium-large terrestrial mammals such as macropods select habitats which provide a dense cover for shelter and refuge and open areas for feeding. The larger species tend to occupy drier more open habitats: the smaller species, moister and more densely vegetated habitats.

All Arboreal mammals that occur in the region (with the exception of the Koala) utilise tree hollows for nesting and shelter (although the Common ringtail possum is not dependent on hollows). Smith & Lindenmeyer (1988) consider that shortage of nest hollows is likely to limit arboreal mammal populations where density of hollow bearing trees is less than 2 to 8 trees per hectare.

Arboreal folivores (e.g. Common ringtail possum, Greater glider) are widespread and abundant but exhibit local variation in response to such factors as tree species composition, foliage protein and fibre levels, leaf toughness, toxins, forest structure and the availability of shelter sites. Arboreal folivores are expected to be most abundant in areas of high productivity, high soil fertility and moderate climate, in conjunction with adequate shelter and suitable foraging substrate.

Arboreal nectarivore/insectivores feed on a wide variety of plant and insect exudates including the nectar of flowering eucalypts, and shrubs such as Banksia and Acacia sp. These species also feed extensively on insects, particularly under the shedding bark of eucalypts. The distribution of nectarivore/insectivores is considered to be related to the abundance of nectar and pollen producing plants, the abundance of bark shedding eucalypts which harbour insect prey, and the occurrence of sap and gum exudate producing trees (Sap feed trees) and shrubs (e.g. Acacia sp.). Arboreal nectarivores and insectivores are generally hollow dependent species.

There are no trees with hollows necessary for hollow-dependent mammals. No primary Koala feed trees were recorded on the Subject Site.

The structural complexity and habitat diversity of the site is likely to support a low diversity of ground dwelling mammals.

Insectivorous bats like insectivorous birds overlap considerably in diet and broad vegetation preferences (Hall 1981), but specialise in foraging in specific layers or substrates within the forest (Crome and Richards 1988). The Study area is likely to provide forage habitat for a low diversity and abundance of insectivorous bats, due to the combination of open and forested areas of vegetation. The site provides a low abundance of fruiting species and represents poor quality foraging habitat for frugivorous bats. There are no old-growth trees for hollow-dependant bats.

3.3.3 **Results of Fauna Survey**

3.3.3.1 Amphibians

One (1) amphibian was recorded, the Common eastern froglet (*Crinia signifera*).



3.3.3.2 Reptiles

No reptile species were recorded during the fauna survey.

3.3.3.3 Birds

Twenty-one (21) bird species were recorded (TABLE 4).

**TABLE 4
RECORDED BIRD SPECIES**

Common name	Scientific name
Brush Bronzewing	<i>Phaps elegans</i>
Cattle Egret	<i>Ardea ibis</i>
Common Bronzewing	<i>Phaps chalcoptera</i>
Dollarbird	<i>Eurystomus orientalis</i>
Eastern Rosella	<i>Platycercus eximius</i>
Figbird	<i>Sphecotheres viridis</i>
Flock Bronzewing	<i>Phaps histrionica</i>
Grey Fantail	<i>Rhipidura fuliginosa</i>
Magpie	<i>Gymnorhina tibicen</i>
Magpie-lark	<i>Grallina cyanoleuca</i>
Noisy Miner	<i>Manorina melanocephala</i>
Pacific Black Duck	<i>Anas superciliosa</i>
Pied Butcherbird	<i>Cracticus nigrogularis</i>
Pied Currawong	<i>Strepera graculina</i>
Rainbow Bee-eater	<i>Merops ornatus</i>
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>
Shining Flycatcher	<i>Myiagra alecto</i>
Topknot Pigeon	<i>Lopholaimus antarcticus</i>
Torresian Crow	<i>Corvus orru</i>
Variegated fairy-wren	<i>Malurus lamberti</i>
Willie Wagtail	<i>Rhipidura leucophrys</i>

3.3.3.4 Mammals

No mammal species were recorded.

3.3.4 Threatened species considered possible occurrences in the Study area

Based on the assessment of habitats in the Study Area, Threatened fauna species known from the locality were assessed for the likelihood of their occurrence (TABLE 5). The following oceanic and coastal species will not occur and are not considered in the table:

Beach stone-curlew; Little tern; Dugong; Red-tailed tropicbird; Sanderling; Great knot; Black-tailed godwit; Sooty and Pied oystercatcher; Southern giant petrel; Greater sand plover; Lesser sand plover; Little tern; Loggerhead turtle; Green turtle; Leathery turtle; Sooty albatross; Wandering albatross; White tern; Broad-billed sandpiper; Humpback whale; New Zealand fur seal; Australian fur seal; Grey ternlet; Gould's petrel; Black-winged petrel; Providence petrel; Little shearwater; Flesh-footed shearwater; Sooty tern; Masked booby and Terek sandpiper.



TABLE 5
LIKELIHOOD OF OCCURRENCE OF THREATENED FAUNA SPECIES

Species	Likelihood of occurrence in the Study area	Notes
Albert's lyrebird (<i>Menura alberti</i>)	Unlikely	Restricted to south-east Queensland and far north-east New South Wales. Inhabits mixed rainforest and wet open forest, frequently dominated by Brush box.
Barred Cuckoo-shrike (<i>Coracina lineata</i>)	Possible	The Barred cuckoo-shrike is generally uncommon and is rare in NSW. This species lives in rainforest, eucalypt forests and woodland, swamp woodlands and timber along watercourses, and wanders nomadically in search of fruit.
Beccari's Free-tail bat (<i>Mormopterus beccarii</i>)	Possible	This species is rare in northern NSW. The only confirmed record in NSW is a colony found in the roof of a house in Murwillumbah. It inhabits a range of vegetation types from rainforests to open forests and woodlands, usually along watercourses.
Black flying-fox (<i>Pteropus alecto</i>)	Possible	Black flying foxes occur in coastal and near-coastal areas across northern Australia. They are relatively uncommon in NSW. Large communal day-time camps occupy remnants of coastal subtropical rainforest or swamp forest and at night they travel up to 50km to feed on blossoms and fruits.
Black-necked stork (<i>Ephippiorhynchus asiaticus</i>)	Unlikely	This species is widespread in northern Australia and sparse in coastal eastern Australia from Qld to southern NSW. It inhabits swamps, mangroves, mudflats, dry floodplains and irrigated land. It occasionally forages in open grassy woodland.
Bush stone-curlew (<i>Burhinus grallarius</i>)	Unlikely	This species is rare east of the Great Divide except for isolated populations along the north coast. It forages and breeds in open-grassed woodlands or sparsely treed rangelands, often with a non-existent shrub layer and abundant leaf litter.
Bush-hen (<i>Amaurornis olivaceus</i>)	Possible	The Bush-hen occurs in coastal northern Australia and through eastern Qld to the NSW North Coast. It inhabits a variety of coastal wetlands from mangroves, lagoons and swamps, to river margins and creeks running through rainforest.
Collared kingfisher (<i>Todiramphus chloris</i>)	Unlikely	The Collared kingfisher is most commonly observed in the Tweed River Estuary in NSW. It is virtually restricted to mangroves and other estuarine habitats in Australia, mainly about the mouths of the larger coastal rivers.



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Species	Likelihood of occurrence in the Study area	Notes
Comb-crested jacana (<i>Irediparra gallinacea</i>)	Unlikely	This species is found in coastal and sub-coastal northern and eastern Australia. In NSW populations are localised and scattered. It lives amongst vegetation floating on the surface of slow-moving rivers and permanent lagoons, swamps, lakes and dams.
Common planigale (<i>Planigale maculata</i>)	Possible	This species occurs in coastal north-east NSW. It occupies a wide range of habitats from rainforest, sclerophyll forest, grasslands, marshlands, rocky areas and even some suburban areas, and usually occurs close to water.
Eastern bent-wing bat (<i>Miniopterus schreibersii oceanensis</i>)	Unlikely	This species occurs throughout eastern Australia. It generally occupies caves and tunnels during the day, but may occasionally roost singularly or in small collectives under the bark of mature paperbark trees.
Eastern Free-tail bat (<i>Mormopterus norfolcensis</i>)	Unlikely	This species is found only from south-east Qld to mid-coastal NSW. Virtually nothing is known about the biology of this distinctive species. It is known to roost in tree-hollows.
Eastern long-eared bat (<i>Nyctophilus bifax</i>)	Possible	This species occurs from Cape York through eastern Qld to the far north-east corner of NSW. It inhabits lowland subtropical rainforest and wet and swamp eucalypt forest, extending into adjacent moist eucalypt forest.
Glossy black cockatoo (<i>Calyptorhynchus lathami</i>)	Unlikely	Found in coastal forests and open inland woodland in eastern Australia. The Glossy black-cockatoos distribution is limited to habitat which contains sufficient seed reserves of their three favoured species of food trees: <i>Allocasuarina littoralis</i> , <i>A. torulosa</i> and <i>A. verticillata</i> (Forshaw 1981) and suitable large hollow bearing trees for nesting.
Green thighed frog (<i>Litoria brevipalmata</i>)	Unlikely	This species occurs in isolated localities along the coast and ranges from the NSW central coast to south-east Qld. It is found in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain.
Grey-headed flying fox (<i>Pteropus poliocephalus</i>)	Possible	This species occurs from central eastern Qld south to Vic. In NSW they mainly occur in coastal areas and along river valleys. They typically roost in conspicuous camps in lowland rainforest and swamp forest, often in isolated remnants or on islands in rivers. They forage on fruit, nectar and pollen in rainforests and eucalypt forests.
Koala (<i>Phascolarctos cinereus</i>)	Unlikely	The Koala occurs in eucalypt woodlands and forests throughout eastern Australia. They inhabit areas where there are appropriate food trees.



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Species	Likelihood of occurrence in the Study area	Notes
Large-footed myotis (<i>Myotis macropus</i>)	Possible	This species is distributed throughout eastern Australia. It forages over bodies of water ranging from rainforest streams to large lakes and reservoirs. It roosts during the day in caves, mines, tunnels, tree hollows and under bridges.
Little bent-wing bat (<i>Miniopterus australis</i>)	Possible	This species occurs in coastal north-east NSW and eastern Qld. It inhabits moist eucalypt forest, rainforest and dense coastal scrub. It generally occupies caves and tunnels during the day, and may occasionally roost singularly or in small collectives under the bark of mature paperbark trees.
Long-nosed potoroo (<i>Potorous tridactylus</i>)	Unlikely	This species occurs in coastal areas from the Gladstone area in Qld to south-west Vic and are regarded as uncommon north of Sydney. They inhabit a range of vegetation communities including rainforest, moist and dry forests, and heathlands.
Magpie goose (<i>Anseranas semipalmata</i>)	Unlikely	The Magpie goose occurs mainly in coastal and sub-coastal areas of northern Australia. The species is now a rare vagrant in NSW. It generally inhabits open lakes, swamps and permanent wetlands which are dominated by rush and sedge vegetation, with grasslands nearby.
Mangrove honeyeater (<i>Lichenostomus fasciolaris</i>)	Unlikely	The Mangrove honeyeater is common in Qld but rare in NSW, where it is known from a few scattered localities, including the Tweed, Richmond and Clarence River estuaries. It primarily inhabits mangroves but also occurs in other near-coastal forests and woodlands, including casuarinas and paperbark swamp forests.
Masked owl (<i>Tyto novaehollandiae</i>)	Unlikely	In NSW this species is recorded sporadically in the north-east along the coast and tablelands. It inhabits dry eucalypt forest and woodlands. It has a large home range of 500 - 1000 hectares covering forested and partly open country.
Mitchell's rainforest snail (<i>Thersites mitchellae</i>)	Unlikely	This snail is restricted to remnant areas of lowland subtropical rainforest and swamp sclerophyll forest with a rainforest understorey on alluvial soils with a basaltic influence on the coastal plain between the Richmond and Tweed Rivers (NPWS 2000).
Osprey (<i>Pandion haliaetus</i>)	Unlikely	This raptor is thinly distributed in coastal Australia. It nests in singularly overtopping, generally dead trees. The Osprey hunts in coastal rivers, estuaries and streams and may gather nesting material from nearby forests.



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Species	Likelihood of occurrence in the Study area	Notes
Pied oystercatcher (<i>Haematopus longirostris</i>)	Unlikely	This species occurs on the coastline and in estuaries around Australia. It inhabits open beaches, intertidal flats and sandbanks and occasionally rocky headlands.
Rose-crowned fruit-dove (<i>Ptilinopus regina</i>)	Possible	The Rose-crowned fruit-dove occurs along the coast and the ranges of Qld and eastern NSW. It occurs mainly in subtropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful.
Sooty owl (<i>Tyto tenebricosa</i>)	Unlikely	In NSW, the Sooty owl occurs throughout the coastal area and adjacent ranges. It inhabits rainforests, particularly rainforest gullies overtopped by eucalypts.
Spotted-tailed quoll (<i>Dasyurus maculatus</i>)	Unlikely	The Spotted-tailed quoll occurs along the escarpments, tablelands and coast of the eastern seaboard. It inhabits a range of habitats including dry and moist sclerophyll forests, woodlands, coastal heathlands and rainforests.
Square-tailed kite (<i>Lophoictinia isura</i>)	Unlikely	This species is uncommon, yet widespread. It is thinly distributed through open forests, woodland and sandplains, both coastal and subcoastal.
Wallum froglet (<i>Crinia tinnula</i>)	Unlikely	The Wallum froglet is found in coastal areas from south-east Qld to the central coast of NSW. It is found only in acid Paperbark swamps and sedge swamps of the coastal 'wallum' country.
White-eared monarch (<i>Monarcha leucotis</i>)	Unlikely	This species is restricted to eastern Qld and the NSW north coast. It occurs primarily in coastal rainforest, swamp forest and wet eucalypt forest and appears to prefer forest edges.
Wompoo fruit dove (<i>Ptilinopus magnificus</i>)	Possible	This species is found along the coast and coastal ranges from Cape York to the Hunter River in NSW. It occurs in rainforests, low-elevation moist eucalypt forest and brushbox forests. They most often occur in mature forests, but are also found in remnant and regenerating forest.



4 IMPACTS AND AMELIORATION

4.1.1 Introduction

This section examines the likely impacts of the Proposed development. The possible direct and indirect impacts of the proposal are outlined and amelioration measures to minimise impacts on flora and fauna are suggested.

4.1.2 Impacts on Plant Communities

The proposed development will result in the loss of vegetation for the construction of buildings, access roads, driveways and associated infrastructure. The impact of the proposed development on the vegetation communities on site is shown (FIGURE 7).

A summary of vegetation types to be lost and their respective areas is shown below (TABLE 6).

TABLE 6
VEGETATION TO BE LOST AS A RESULT OF THE PROPOSED DEVELOPMENT

Vegetation Community	Total area (m ²)	Area lost (m ²)	Area lost (%)
Community 1 - Tall Closed Forest (<i>Cinnamomum camphora</i> ± mixed Rainforest species)	366	0	0
Community 2 - Mid-high Open Forest (<i>Cinnamomum camphora</i>)	2613	2613 ³	100
Community 3 - Low Open Woodland (<i>Acacia melanoxylon</i>)	397	258	65
Community 4 - Mid-high Open Forest (<i>Jagera pseudorhus</i>)	174	174	100
Community 5 - Low Closed Herbland (Mixed exotic weed species)	43171	33933	79
TOTAL	46721 m²	36977 m²	79

A total 3.7 hectares of vegetation will be lost from the Subject Site. The majority of this will be from Community 5, a Low Closed Herbland consisting of exotic weed species.

4.1.3 Amelioration for Plant Communities

The Proposed development will enhance the natural environment of the Subject Site through a Vegetation Rehabilitation Plan (VRP) (JWA 2009b). The VRP will outline best practice for the removal of exotic weeds species (mostly Camphor laurel) and provide guidelines for the rehabilitation and revegetation of the Riparian buffer zone.

³ Some existing Camphor laurels, along Urliup and Bilambil Roads, will remain as streetscape trees for the medium to long term.



Legend

- Community 1: Tall Closed Forest (*Cinnamomum camphora* +/- Mixed rainforest species)
- Community 2: Mid-high Open Forest (*Cinnamomum camphora*)
- Community 3: Low Open Woodland (*Acacia melanoxylon*)
- Community 4: Mid-high Open Forest (*Jagera pseudorhus*)
- Community 5: Low Closed Herbland (Mixed weed species)
- Rough-shelled bush nut (*Macadamia tetraphylla*)
- Riparian Management Zone
- Easement / Landscape Area / Regeneration Area
- Batter
- Inner APZ - Managed Grassland with Scattered Trees
- Outer APZ - Low Density Plantings and Groundcovers
- Subject Site

0 50m



SOURCE: JWA Site Investigations; Google Earth 2008 Aerial; B & P Surveys (Ref: Plan subdivision layout Option 7.pdf)

SCALE: 1 : 2000 @ A4

JAMES WARREN & ASSOCIATES PTY LIMITED
Environmental Consultants

CLIENT
John Sherwood / Jackson International Pty Ltd

PROJECT
Flora & Fauna Assessment
Lots 2 & 3 DP244652
Urlup Road, Bilambil, NSW
Tweed Shire Council LGA

FIGURE 7

PREPARED: BW
DATE: 07 December 2009
FILE: N08003_Impacts.cdr

TITLE
**IMPACTS OF
PROPOSED
DEVELOPMENT ON
VEGETATION**



The work outlined in the VRP will be completed by a qualified and experienced Bush Regeneration Company be employed by Plateau Nominees. The VRP will allow for five (5) years maintenance and will ensure an adequate final result through regular monitoring and reporting of the progress to Tweed Shire Council and the Department of Planning.

Other amelioration measures include:

- Landscape plantings in the streets, park and power easement should include a majority of native species that provide forage habitat for nectarivorous and frugivorous birds and bats;
- Landscaping trees should be situated where possible to reduce the amount of disturbance to retained areas of habitat;
- Weeds should be controlled during construction;
- Vegetation removed during construction should be mulched for use on the site reducing the probability of introducing weeds in imported mulch;
- Weeds should be controlled in landscaped areas and areas of retained vegetation; and
- Known environmental weeds (e.g. Umbrella tree) should be avoided.

4.1.4 Impacts on Threatened Flora

The Proposed development layout will result in the loss of one (1) stem of the Threatened flora species, the Rough-shelled bush nut (*Macadamia tetraphylla*).

The impact of the Proposed development on Threatened flora recorded on the site is further discussed in Section 4.2.2.

4.1.5 Amelioration for Threatened Flora

One (1) stem of the Threatened species Rough-shelled bush nut was recorded within the development layout. JWA has completed a Translocation Plan for this plant (JWA 2009a).

4.1.6 Impacts on Fauna

The proposed development will result in some loss of foraging, sheltering and breeding habitat for native fauna occurring in the locality. This loss may have a range of impacts including:

- Loss of forage habitat for nectarivorous and insectivorous fauna species, including the loss of autumn/winter flowering plants;
- Minor decrease in the size of local fauna populations and increased susceptibility to threatening processes acting in the locality;
- Minor decrease in the size of the prey base for carnivorous species;
- Increased fragmentation of habitat in the locality;
- Some decrease in the genetic base for local fauna populations;
- Loss of sheltering and breeding habitat for native fauna;
- Reduction in opportunities for movement through the site;
- Loss of eucalypts, paperbarks, banksias and flowering shrubs decrease the food supply for nectarivores;
- Animals may be killed or injured during the clearance of vegetation;



- Domestic dogs and cats prey on native fauna and may have significant impacts on the populations of native species;
- Development of the Subject Site may favour native and introduced disturbance adapted competitors. For example, Cane toads may out-compete other Amphibians and Reptiles, aggressive open country birds species (eg Noisy miner, Crow, Pied currawong) may out-compete other birds, and non-native mammals (Black rat and House mouse) may out-compete other native small mammals;
- Increased light, noise and activity may cause reclusive species to move away from habitat edges;
- The Proposed development will result in an increase in traffic on and to the Subject Site. This increases the likelihood of animals being killed or injured by vehicles; and
- Alterations to site hydrology and land use may alter the water quality or hydrological regime in neighbouring areas of Bilambil Creek and the Cobaki Broadwater.

4.1.7 Amelioration for Fauna

The following amelioration measures apply:

- Residents should control dogs and cats in accordance with the Animal Keeping Guidelines set out by the Tweed Shire Council;
- Residents should dispose of rubbish and food scraps appropriately to reduce opportunities for non-native predators and disturbance adapted competitors;
- Landscape and landfill materials should be sourced from a supplier where Cane toads do not occur;
- Mature habitat trees should be retained where possible.

4.1.8 Possible Impacts on Bilambil Creek and the Cobaki Broadwater

Bilambil Creek runs adjacent to the west boundary of the Subject site and flows into the Cobaki Broadwater to the north-east of the Site. The proposed development has the potential to impact on these water bodies the associated wetland vegetation communities within it in the following ways:

- Stormwater runoff from the proposed development may cause an increase in sediment, dissolved salts and general urban pollution and rubbish.
- Occupation of the Site may cause an increase in local populations of invasive pest species (e.g. rats, cane-toads, foxes) and invasive weeds.
- Residents of the Site may dump rubbish and garden wastes into or near the Creek encouraging pest species and allowing the release of weed species, parasites and diseases into the Broadwater.
- Domestic animals may predate on or disturb fauna within the Broadwater.
- Increased light and noise from the Site may disturb the more reclusive species, in effect increasing the penetration of edge effects into the Nature Reserve.
- Occupation of the Site may reduce the effectiveness of dispersal vectors and dispersal life-cycle stages of fauna and flora from the Nature Reserve to the nearest wetlands in the south-east.



4.1.9 Amelioration for Bilambil Creek and the Cobaki Broadwater

The Proposed development will enhance the natural environment of the Subject Site through a Vegetation Rehabilitation Plan (VRP) (JWA 2009b). The vegetation along Bilambil Creek will be rehabilitated by facilitated natural regeneration and revegetation. The area will be restored to a Sub-tropical Riparian Rainforest community. Additionally, this will assist to stabilise the banks of Bilambil Creek reducing erosion preventing any flow on effects to the Cobaki Broadwater.

The proposed drainage reserve and retention pond located in the south west of the site should also be specifically designed to:

- (1) retain and slowly release stormwater runoff in Bilambil Creek; and
- (2) remove common pollutants such as sediment, bacteria, greases, metals, total suspended solids, phosphorous, nitrogen, and trash pollutants from the water before it flows into Bilambil Creek.

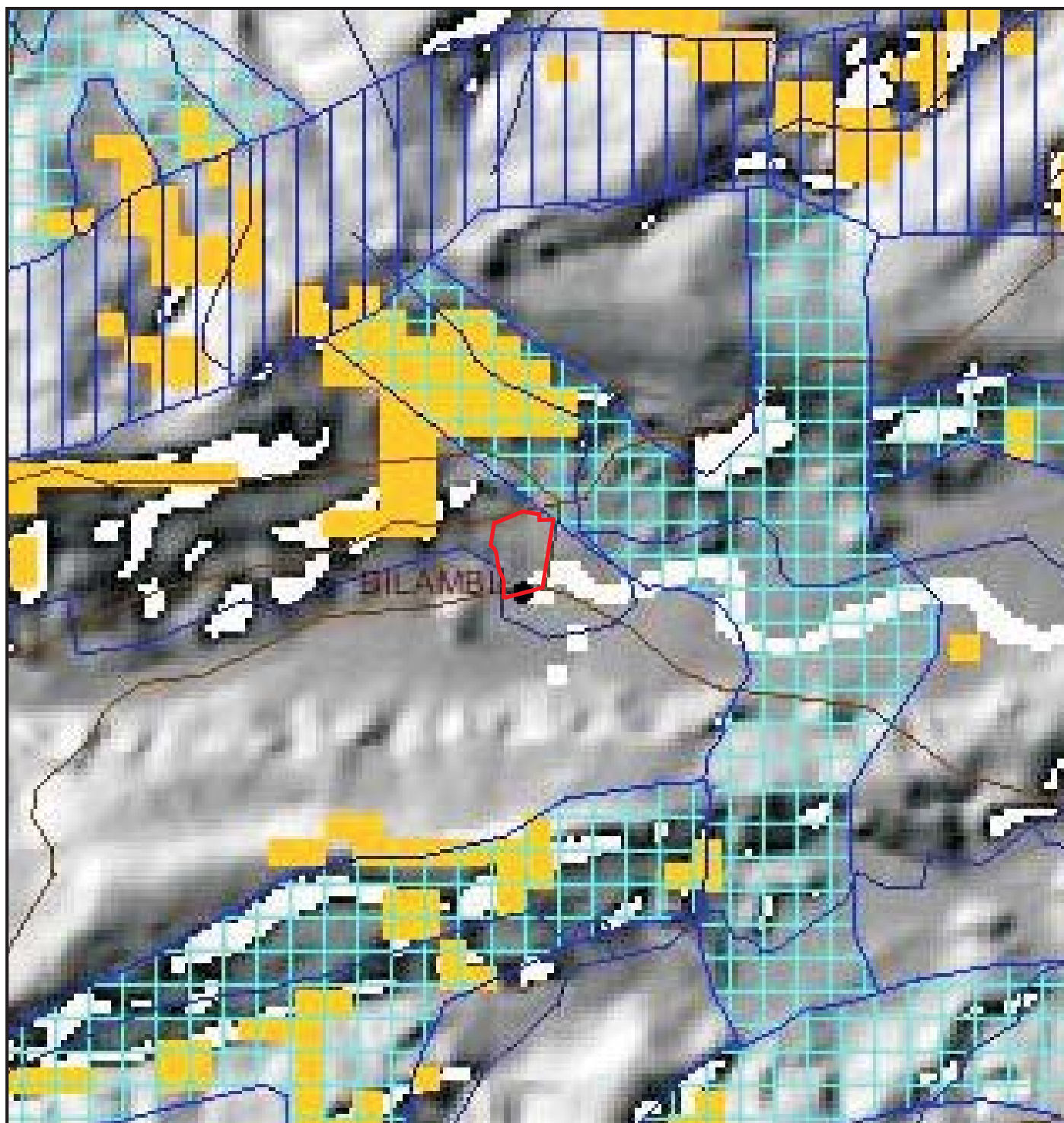
4.1.10 Corridor Impacts

The NPWS Key Habitats and Corridors database (NSWPS 2008) shows two habitat corridors within the locality of the site (**FIGURE 8**). The Subject Site itself occurs adjacent to the Bilambil Sub-regional Corridor which links McAlister's Road and Durobby Creek. Approximately 1.2 km to the north-west of the site lies the McPherson Range - Cobaki Regional Corridor which links Mt Tomewin and McAlister's Road.

The Subject Site is not part of the above corridors. The Proposed development will not contribute towards a reduction in the overall effectiveness of the site as a corridor. Only very poor quality habitat will be lost from the proposed development.

4.1.11 Amelioration for Corridor

The site will be improved, as a fauna corridor, after a Vegetation Rehabilitation Plan (JWA 2009b). The implemented of a VRP will restore the riparian area of Bilambil creek to a Sub-tropical Riparian Rainforest and provide a 35m vegetated buffer (i.e. Fauna corridor) along the creek bank.



Legend

Key Habitats and Corridors:
 Regional Corridor
 Subregional Corridor
 Key Habitat

Tenure:
 Aboriginal Area
 Historic Site
 National Park
 Nature Reserve
 Regional Park
 State Recreation Area
 State Forest

Other:
 Towns
 Rivers
 Main Roads
 Minor Roads
 Wooded Vegetation
 Subject Site

0 500m



SOURCE: NSW NPWS Key Habitats & Corridors
in North East NSW (NPWS website 21.05.08)

SCALE: 1 : 20 000 @ A4

JAMES WARREN & ASSOCIATES PTY LIMITED
Environmental Consultants

CLIENT
John Sherwood / Jackson International Pty Ltd
PROJECT
Flora & Fauna Assessment
Lots 2 & 3 DP244652
Uriup Road, Bilambil, NSW
Tweed Shire Council LGA

FIGURE 8

PREPARED: BW
DATE: 25 November 2009
FILE: N08003_Corridors.cdr

TITLE

CORRIDORS



5 STATUTORY CONSIDERATIONS

5.1 Introduction

This section includes assessments of the impacts of the Proposed development with regard to:

- Section 5A of the Environment Protection & Assessment Act (EP & A) (1979);
- State Environmental Planning Policy (SEPP) No. 44 - Koala Habitat Protection;
- Fisheries Management Act (FM); and
- The Commonwealth Environment Protection and Biodiversity Conservation Act (EPBC) (1999).

5.2 Assessment of Significance (Seven Part Test)

5.2.1 Background

Under the Threatened Species Conservation Amendment Act 2002, the factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, populations or ecological communities, or their habitats have been revised (previously known as the "8-part test"). This affects:

- s5A EP&A Act 1999,
- s94 TSC Act 1995; and
- s220ZZ FM Act 1994.

The revised factors maintain the same intent but focus consideration of likely impacts in the context of the local rather than the regional environment. The long-term loss of biodiversity at all levels arises primarily from the accumulation of losses and depletions of populations at a local level. This is the broad principle underpinning the TSC Act, State and Federal biodiversity strategies and international agreements. The consideration of impacts at a local level is designed to make it easier for local government to assess, and easier for applicants and consultants to undertake the Assessment of Significance. There is no longer a need to research regional and statewide information. The Assessment of Significance is only the first step in considering potential impacts. Further consideration is required when a significant effect is likely. The preparation of a Species Impact Statement is required.

The Assessment of Significance should not be considered a "pass or fail" test as such, but a system allowing proponents to undertake a qualitative analysis of the likely impacts and ultimately whether further assessment needs to be undertaken via a Species Impact Statement. All factors must be considered and an overall conclusion must be drawn from all factors in combination. Where there is any doubt regarding the likely impacts, or where detailed information is not available, a Species Impact Statement should be prepared.

5.2.2 Flora

5.2.2.1 Rough-shelled bush nut (*Macadamia tetraphylla*)

One (1) stem of *Macadamia tetraphylla* was recorded on the Subject Site. An Assessment of Significance will be completed for this species.



Extent of the local population

The NPWS database (July 2008) contains eight (8) records of this species within 10 km of the Subject Site. Sixty-six (66) records occur within the Tweed LGA.

Stages of the life-cycle affected by the proposed development

The Rough-shelled bush nut occurs in Subtropical rainforest, usually near the coast, and is confined mainly to the Richmond and Tweed Rivers in north-east NSW, extending over the border into Queensland (NPWS 2002).

The main habitat for *Macadamia tetraphylla* is Subtropical Rainforest near the coast (Floyd 1989). It is also found in notophyll vine forest (Quinn *et al.* 1995). Neither Floyd (1989), Barry & Thomas (1994) nor Quinn *et al.* (1995) discuss the pollination or dispersal vectors for this species. Bees have been observed on the flowers of this species on a number of occasions and may be responsible for pollination. Rodents are known to take fruits of the similarly sized *M. integrifolia* from plantations. It is likely that rodents are also involved in the dispersal of Queensland Nut in natural situations. Gravity and water may also play a role in dispersal.

NPWS have identified the following threats to the species:

- Clearing and fragmentation of habitat for coastal development, agriculture and roadwork;
- Low numbers increasing the risk of local extinction;
- Grazing and trampling by domestic stock;
- Fire;
- Invasion of habitat by introduced weeds; and
- Loss of local genetic strains through hybridisation with commercial varieties.

Likelihood of local extinction

The Proposed development will result in the translocation of this specimen. The Proposed development is unlikely to result in the local extinction of this species.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable.

(c) In the case of an endangered ecological community or critically endangered ecological community whether the action proposed:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*



Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed;*

Ideal habitat for the *Macadamia tetraphylla* is considered to be Subtropical Rainforest. Approximately 0.2 hectares of Tall Closed Forest (Camphor laurel) will be lost for the proposed development and this area is considered to represent potential habitat on the Subject Site. Additionally, 0.01 hectares of Mid-high Open Forest (*Jagera pseudorhus*) will also be lost which represents the current habitat of the *Macadamia tetraphylla*.

- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;*

No areas of habitat are likely to become fragmented or isolated from other areas of habitat as a result of the proposed development.

- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Approximately four (4) hectares of land is to be modified for the Proposed development. 93% of this is Low closed hermland dominated by weeds and is considered of very low importance to the long-term survival of the *Macadamia tetraphylla* in the locality. The minor reduction of the remaining habitat will not cause a significant effect on the local population of this species.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

There will be no adverse effects on any of the critical habitats listed under the *Threatened Species Conservation Act (1995)* from the action proposed.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No approved recovery plan exists for this species.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

A “threatening process” means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of a species, population or ecological community. Key Threatening Processes have been listed in Schedule 3 of the *TSC Act (2002)* and are listed in **APPENDIX 2**.

The Proposed development will contribute towards the clearing of native vegetation, a key threatening process listed on Schedule 3 of the *TSC Act (2002)*. The final



determination of the NSW Scientific Committee notes that clearing of native vegetation is recognised as a major factor contributing to loss of biological diversity, with impacts such as: destruction of habitat; fragmentation of habitat; riparian zone degradation; increased greenhouse gas emissions; increased habitat for invasive species; loss of leaf litter layer; loss or disruption of ecological function (e.g. loss of populations of pollinators or seed dispersers) and changes to soil biota.

Habitat loss is the main threatening process affecting all Subject species. The Proposed development will make a minor contribution towards the loss of habitat in the region.

On the basis of this assessment, it is considered that a Species Impact Statement (SIS) is not required.

5.2.3 Fauna

An Assessment of Significance will be completed for each of the threatened fauna species considered a possible occurrence on the Subject Site.

(a) In the case of a Threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

5.2.3.1 Barred cuckoo-shrike (*Coracina lineata*)

Extent of the local population

The NPWS database contained 2 records of this species within 10 kilometres of the Study area and 14 in the Tweed LGA.

Stages of the life-cycle affected by the proposed development

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the north-east region. The analysis was based on local expert knowledge and identified breeding and sheltering sites for the Barred cuckoo shrike as consisting of low elevation subtropical and littoral rainforest and coastal wet sclerophyll forest close to fruiting figs with the preferred habitat being a mature canopy. The Barred cuckoo-shrike forages in mature canopy and feeds on fruit and large insects including cicadas and phasmids with other small fruited figs as their preferred food.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Barred cuckoo-shrike, with the following results:

1 st order disturbances	Urban development Weed invasion Loss of habitat trees (fig trees) in agricultural land Intensive horticulture
------------------------------------	--

Likelihood of local extinction

The Proposed development will not cause a reduction in any local habitat for this species. The proposed rehabilitation of the Riparian buffer to Bilambil Creek will increase available habitat. It is unlikely that the Proposed development will cause the local extinction of this species.



5.2.3.2 Beccari's free-tail bat (*Mormopterus beccarii*)

Extent of the local population

The NPWS database contains 1 record of this species within 10 kilometres of the Study area and 3 records in the Tweed LGA.

Stages of the life-cycle affected by the proposed development

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the north-east region. The analysis was based on local expert knowledge and identified breeding and sheltering sites for Beccari's free-tail bat as consisting of hollows in trees and dead stags. Beccari's free-tail bat forages in open forests and feeds on flying insects.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Beccari's free-tail bat, with the following results:

1 st order disturbances	Clearing - loss of habitat Logging - loss of hollows
3 rd order disturbances	Clearing - fragmentation Frequent burning (impact on invertebrates) Pesticides Grazing
5 th order disturbances	Logging - loss of understorey complexity Wildfire

Likelihood of local extinction

The Proposed development will not cause a reduction in any local habitat for this species. The proposed rehabilitation of the Riparian buffer to Bilambil Creek will increase available habitat. It is unlikely that the Proposed development will cause the local extinction of this species.

5.2.3.3 Black flying fox (*Pteropus alecto*)

Extent of the local population

The NPWS database contained 11 records of this species within 10 kilometres of the Study area and 48 records in the Tweed LGA.

Stages of the life-cycle affected by the proposed development

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the north-east region. The analysis was based on local expert knowledge and identified breeding sites for the Black flying fox as consisting of sub-tropical rainforest and swamp forest with a complex mosaic of rainforest, swamp and sclerophyll forest resources less than 40–50km from the roost. There is high site fidelity, with roosts often in riverine rainforest. The Black flying fox forages in subtropical rainforest with mosaic of resources including rainforest fruit, nectar and pollen.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Black flying fox, with the following results:



Flora and Fauna Assessment

1 st order disturbances	Clearing - habitat loss
2 nd order disturbances	Direct disturbance to camps and proximity to humans Drainage of swamps
3 rd order disturbances	Shooting Power lines Logging of Sclerophyll forest - loss of older trees Management burns
4 th order disturbances	Clearing resulting in fragmentation, Wildfire Weed invasion

Likelihood of local extinction

The Proposed development will not cause a reduction in any local habitat for this species. The proposed rehabilitation of the Riparian buffer to Bilambil Creek will increase available habitat. It is unlikely that the Proposed development will cause the local extinction of this species.

5.2.3.4 Bush-hen (*Amaurornis olivaceus*)

Extent of the local population

The NPWS database contains 3 records of this species within 10 kilometres of the Study area and 25 records in the Tweed LGA.

Stages of the life-cycle affected by the proposed development

The NPWS Threatened Species Information records the following information on the distribution and ecology of the Bush-hen.

The Bush-hen occurs in a variety of coastal wetlands from mangroves, lagoons and swamps, to river margins and creeks running through rainforest. It has also been recorded away from water in dense low vegetation, including Blady grass and the introduced Lantana.

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the north-east region. The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Bush-hen, with the following results:

1 st order disturbances	Predation by exotics Grazing (in riparian vegetation) Urban development
2 nd order disturbances	Chemical pollutants

Likelihood of local extinction

The Proposed development will not cause a reduction in any local habitat for this species. The proposed rehabilitation of the Riparian buffer to Bilambil Creek will



increase available habitat. It is unlikely that the Proposed development will cause the local extinction of this species.

5.2.3.5 Common planigale (*Planigale maculata*)

Extent of the local population

The NPWS database contains 4 records of this species within 10 kilometres of the Study area and 26 records in the Tweed LGA.

Stages of the life-cycle affected by the proposed development

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the north-east region. The analysis was based on local expert knowledge and identified breeding and sheltering sites for Planigales as consisting of nests of eucalypt leaves in logs or under bark, in cracks in the soil or in grass tussocks. Nests were also located in building debris. The Common planigale forages in dry sclerophyll, swamp sclerophyll, heathland and grassland at the ecotone with rainforest in areas with dense leaf litter or ground cover.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Common planigale, with the following results:

1 st order disturbances	Predation by cats Loss of habitat
2 nd order disturbances	Altered fire regimes Baiting for dingoes
3 rd order disturbances	Exotic competitors
4 th order disturbances	Predation by cane toads

Likelihood of local extinction

The Proposed development will not cause a reduction in any local habitat for this species. The proposed rehabilitation of the Riparian buffer to Bilambil Creek will increase available habitat. It is unlikely that the Proposed development will cause the local extinction of this species.

5.2.3.6 Eastern long-eared bat (*Nyctophilus bifax*)

Extent of the local population

The NPWS database contains 3 records of this species within 10 kilometres of the Study area and 16 records in the Tweed LGA.

Stages of the life-cycle affected by the proposed development

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the north-east region. The analysis was based on local expert knowledge and identified breeding sites for the Eastern long-eared bat as consisting of hollows in littoral and subtropical rainforest and other associated moist and coastal swamp forest. This species will roost communally in foliage. The Eastern long-eared bat forages on flying insects and gleans insects from leaves and bark. It prefers structurally complex forests.



The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Eastern long-eared bat, with the following results:

1 st order disturbances	Clearing - habitat loss
2 nd order disturbances	Clearing - fragmentation
3 rd order disturbances	Logging - loss of understorey Frequent burning Grazing Mining - sand
4 th order disturbances	Logging - loss of hollows Weed invasion Weed spraying
5 th order disturbances	Dams Wildfire Road kills

Likelihood of local extinction

The Proposed development will not cause a reduction in any local habitat for this species. The proposed rehabilitation of the Riparian buffer to Bilambil Creek will increase available habitat. It is unlikely that the Proposed development will cause the local extinction of this species.

5.2.3.7 Grey-headed flying fox (*Pteropus poliocephalus*)

Extent of the local population

The NPWS database contains 6 records of this species within 10 kilometres of the Study area and 184 records in the Tweed LGA.

Stages of the life-cycle affected by the proposed development

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the north-east region. The analysis was based on local expert knowledge and identified breeding and sheltering sites for the Grey-headed flying fox as consisting of mainly rainforest and moist riparian forest with a complex mosaic of rainforest, swamp and sclerophyll forest resources less than 40-50km from roost. There is high site fidelity with roosts often in riverine rainforest. The Grey-headed flying fox forages in subtropical rainforest with a mosaic of resources - rainforest fruit, nectar and pollen. The Grey-headed flying fox is less restricted to rainforest remnants than the Black flying fox.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Grey-headed flying fox, with the following results:

1 st order disturbances	Clearing - habitat loss
2 nd order disturbances	Direct disturbance to camps Drainage of swamps
3 rd order disturbances	Powerlines



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	Logging of Sclerophyll Management burns Shooting
4 th order disturbances	Clearing resulting in fragmentation Wildfire
5 th order disturbances	Disease - lyssavirus Apiary Barbed wire fences Weed invasion
6 th order disturbances	Climate change

Likelihood of local extinction

The Proposed development will not cause a reduction in any local habitat for this species. The proposed rehabilitation of the Riparian buffer to Bilambil Creek will increase available habitat. It is unlikely that the Proposed development will cause the local extinction of this species.

5.2.3.8 Large-footed myotis (*Myotis macropus*)

Extent of the local population

The NPWS database contains 1 record of this species within 10 kilometres of the Study area and 13 records in the Tweed LGA.

Stages of the life-cycle affected by the proposed development

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the north-east region. The analysis was based on local expert knowledge and identified breeding and sheltering habitat for the Large-footed myotis as consisting of any forested riparian and adjacent vegetation around water bodies and coastal lakes and streams greater than first order streams. Breeding is in hollows, as well as under bridges and in caves. The Large-footed myotis forages in still water bodies with associated vegetation (tree line) feeding on aquatic and other flying insects, and small fish.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Large-footed myotis, with the following results:

1 st order disturbances	Clearing - habitat loss (riparian vegetation) Clearing - fragmentation
2 nd order disturbances	Use of chemicals Grazing Use of chemicals - mosquito control, pesticides
3 rd order disturbances	Altered hydrology - sedimentation Altered hydrology - altered flow Bridge removal Eutrophication from grazing, agriculture and sewage Dams



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4 th order disturbances	Logging - loss of hollows Frequent burning
5 th order disturbances	Recreational activities - fly fishing, boating Weeds
6 th order disturbances	Fish (trout)

Likelihood of local extinction

The Proposed development will not cause a reduction in any local habitat for this species. The proposed rehabilitation of the Riparian buffer to Bilambil Creek will increase available habitat. It is unlikely that the Proposed development will cause the local extinction of this species.

5.2.3.9 Little bent-wing bat

Extent of the local population

The NPWS online database contains 10 records of this species within 10 kilometres of the Study area and 36 records in the Tweed LGA.

Stages of the life cycle affected by the proposed development

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the north-east region. The analysis was based on local expert knowledge and identified breeding sites for Little bent-wing bat as consisting of limestone caves, where it usually occurs in association with the Common bent-wing bat. It congregates in high numbers in maternity roost (in 1000's). It also shelters in a range of artificial structures including culverts, drains, mines etc. The Little bent-wing bat forages on flying insects in forested areas, predominantly swamp forest, moist eucalypt forest, rainforest and some dry forests.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Little bent-wing bat, with the following results:

1 st order disturbances	Clearing - habitat loss
2 nd order disturbances	Disturbance to camps/caves by limestone mining (cave collapse, altered air flow, noise, dust etc) and recreational activities.
3 rd order disturbances	Clearing - fragmentation Logging - loss of foraging habitat Frequent burning Altered hydrology/microclimate - old growth-regrowth
4 th order disturbances	Grazing Wildfire Pesticides
5 th order disturbances	Introduced predators



Likelihood of local extinction

The Proposed development will not cause a reduction in any local habitat for this species. The proposed rehabilitation of the Riparian buffer to Bilambil Creek will increase available habitat. It is unlikely that the Proposed development will cause the local extinction of this species.

5.2.3.10 Rose-crowned fruit-dove (*Ptilinopus regina*)

Extent of the local population

The NPWS database contained 2 records of this species within 10 kilometres of the Study area and 28 records in the Tweed LGA.

Stages of the life-cycle affected by the proposed development

The Rose-crowned fruit-dove forages in lowland subtropical rainforest including remnants dominated by Camphor laurel, Littoral rainforest and wet sclerophyll forests. The Camphor laurel has become very important in replacing lowland species previously used but now cleared (Environment Australia 1999). Other habitats occupied are gallery forests or sclerophyll woodlands (often dominated by *Melaleuca* or *Eucalyptus* species), with abundant fruiting trees, near or next to rainforest (Marchant & Higgins 1993). The Rose-crowned fruit-dove appears to be tolerant of disturbance, having been recorded in patches of rainforest as small as two (2) hectares (Frith 1952).

Breeding and sheltering sites for the Rose-crowned fruit-dove consist of scattered patches of habitat in lowland subtropical rainforest including remnants dominated by Camphor laurel and wet sclerophyll forests (Environment Australia 1999). The Rose-crowned fruit-dove erects nests usually within 6m of the ground, thus rainforest of any age and structure is suitable (Recher & Date 1988).

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the north-east region. The analysis was based on local expert knowledge and ranked the significance of various forms of disturbance for the Rose-crowned fruit-dove, with the following results:

1 st order disturbances	Clearance for agriculture Urban development Weed invasion Loss of habitat Intensive horticulture
2 nd order disturbances	Logging that reduces age classes of mesomorphic mid-storey

Likelihood of local extinction

The removal of Camphor laurel from the riparian zone may cause a minor reduction in potential habitat on the Subject Site. The planned revegetation of the Riparian buffer zone with Lowland rainforest species will adequately compensate for this loss. It is unlikely that the Proposed development will cause the local extinction of the Rose-crowned fruit-dove.



5.2.3.11 Wompoo fruit-dove (*Ptilinopus magnificus*)

Extent of the local population

The NPWS database contains 2 records of this species within 10 kilometres of the Study area and 66 records in the Tweed LGA.

Stages of the life-cycle affected by the proposed development

The Wompoo fruit-dove forages in subtropical, dry, warm-temperate and littoral rainforests and occasionally in wet sclerophyll forests, tall open forest, gallery forest, open woodlands or vine thickets near rainforests (Environment Australia 1999; Marchant & Higgins 1993).

Breeding sites for the Wompoo fruit-dove consist of subtropical, dry and warm-temperate rainforests and wet sclerophyll forests, with a good fruit supply nearby (Environment Australia 1999). Common food items include the fruits of Figs, Laurels, Quondongs and Giant stinging trees, as well as scattered Figs in cleared habitat. This bird disperses from higher to lower elevations in autumn/winter, with its movements tracking food availability (Environment Australia 1999; Lindsey 1992).

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the north-east region. The analysis was based on local expert knowledge and ranked the significance of various forms of disturbance for the Wompoo fruit-dove, with the following results:

1 st order disturbances	Clearing for agriculture Logging that reduces size class of fleshy fruit trees in wet sclerophyll forest
2 nd order disturbances	Weed invasion in lowland remnants Urban development Loss of habitat and fig trees in agricultural land
3 rd order disturbances	Intensive horticulture

Likelihood of local extinction

The removal of Camphor laurel from the Riparian zone and other areas may cause a minor reduction in the potential habitat for this species on the Subject Site. The planned revegetation of the Riparian buffer zone with Lowland rainforest species will adequately compensate for this loss. It is unlikely that the Proposed development will cause the local extinction of the Rose-crowned fruit-dove.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Thirty-three (33) endangered populations have been identified under the *TSC Act*. The following four (4) endangered populations occur in north-eastern NSW:

- Long-nosed potoroo population, Cobaki Lakes and Tweed Heads West;
- Emu population in the NSW North Coast Bioregion and Port Stephens LGA;
- Low growing form of *Zieria smithii*, Diggers Head; and
- *Glycine clandestina* (Broad-leaf form) in the Nambucca LGA.



The proposed action will not have an adverse affect on any of these endangered populations.

(c) In the case of an endangered ecological community or critically endangered ecological community whether the action proposed:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable

(d) In relation to the habitat of a threatened species, population or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Response (i)

The majority of the site (Community 5 - Low Closed Herbland) is not considered to represent suitable habitat for any of the local threatened fauna species. The small areas of Community 2 - Mid-high Open Forest (Camphor laurel) may provide a stepping stone type habitat for bird and bat species as they move between much larger areas of rainforest and wet sclerophyll forest (quality habitats) within the locality. Community 2- Mid-high Open Forest (Camphor laurel) will be lost. Community 1 will be rehabilitated. A Riparian Management Plan (RMP) has been prepared outlining the guidelines for the regeneration and revegetation of the riparian area of Bilambil Creek.

Response (ii)

No areas of habitat will become fragmented or isolated from other areas of habitat as a result of the Proposed development.

Response (iii)

The small areas of potential habitat to be removed or modified are not considered to represent an important breeding or roosting habitat for any of the local threatened species. It is considered that the site may represent a minor foraging habitat for the threatened Rainforest birds and frugivorous bats in the locality.

The small patches of Camphor laurel forest are not considered to be important to the long term survival of the locally occurring threatened fauna species.



(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Critical habitat areas listed under the Threatened Species Conservation Act (1995) currently consist only of habitat for:

- Mitchell's Rainforest Snail in Stotts Island Nature Reserve - critical habitat declaration
- Little penguin population in Sydney's North Harbour - critical habitat declaration
- Wollemi Pine - critical habitat declaration
- Gould's Petrel - critical habitat declaration

There will be no adverse effects on these critical habitats from the action proposed.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

An Approved recovery plan has not been completed for the threatened species considered a possible occurrence at this site.

To date, only two Threat abatement plans have been approved:

- Predation by the Red fox
- Invasion by the Plague minnow

Neither of these invasive species are likely to have a significant impact on fauna on the Subject Site.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

A “threatening process” means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of a species, population or ecological community. Key Threatening Processes have been listed in Schedule 3 of the *TSC Act (1995)* and are shown in **APPENDIX 2**.

The Proposed development will contribute towards the clearing of native vegetation, a key threatening process listed on Schedule 3 of the *TSC Act (1995)*. The final determination of the NSW Scientific Committee notes that clearing of native vegetation is recognised as a major factor contributing to loss of biological diversity, with impacts such as: destruction of habitat; fragmentation of habitat; riparian zone degradation; increased greenhouse gas emissions; increased habitat for invasive species; loss of leaf litter layer; loss or disruption of ecological function (e.g. loss of populations of pollinators or seed dispersers) and changes to soil biota.

The amount of native vegetation to be cleared is minor. Amelioration measures have been recommended to compensate for the loss of vegetation on the Subject Site.

The Proposed development is likely to result in the operation of, or increase the impact of, these additional key threatening process, including.



- Introduction of the Cane toad, *Bufo marinus*;
- Invasion of the yellow crazy ant;
- Entanglement in, or digestion of anthropogenic debris in marine and estuarine environments;
- Removal of dead wood and dead trees;
- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- Clearing of native vegetation;
- Bushrock removal;
- Ecological consequences of high frequency fires;
- Human-caused climate change;
- Loss and/or degradation of sites used for hilltopping by butterflies;
- Predation by the European red fox;
- Predation by feral cats;
- Importation of red imported fire ants into NSW; and
- Competition and grazing by the feral European rabbit.

Habitat loss is the main threatening process affecting all Subject species. The Proposed development will make a contribution towards the loss of habitat in the region.

On the basis of this assessment, it is considered that a Species Impact Statement (SIS) is not required.



5.3 Koala Habitat Assessment - SEPP 44

In response to the state-wide decline of Koala populations the Department of Planning has enacted SEPP-44 Koala Habitat Protection. The Policy aims to “encourage the proper conservation and management of area of natural vegetation that provide habitat for Koalas, to ensure permanent free-living populations over their present range and to reverse the current trend of population decline.”

A number of criteria in the SEPP are to be addressed

1. Does the policy apply?

Does the subject land occur in an LGA identified in Schedule 1?

The Subject Site occurs in the Tweed valley LGA, which is listed under Schedule 1.

Is the landholding to which the DA applies greater than 1 hectare in area?

Yes.

2. Is the land potential Koala habitat?

Does the site contain areas of native vegetation where the trees of types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component?

No Trees listed in Schedule 2 (Koala feed trees) occur on the site.

3. Is there core Koala habitat on the subject land?

Under SEPP 44 core Koala habitat is defined as ‘an area of land with a resident population of Koalas, evidenced by attributes such as breeding females (that is females with young) and recent sightings of and historical records of a population’.

No evidence of Koala activity was recorded from the site or adjacent areas, no records of a resident population or evidenced by attributes such as breeding females, exist on the Subject Site. It is considered that Koalas may occasionally disperse across a section of the site whilst moving through the locality.

It is considered that the site does not support core Koala habitat.

4. Is there a requirement for the preparation of a Plan of Management for identified core Koala habitat?

No.



5.4 Assessment of the Fisheries Management Act

5.4.1 Introduction

This section discusses the NSW Fisheries Management Act and provides for an assessment of the Proposed development in regard to habitat of any threatened fish species.

Aquatic habitats vary widely; in freshwater areas you'll find freshwater streams, rivers, lakes, floodplain wetlands, swamps, bogs and underground aquifers. Salty and brackish water habitats include beaches, rocky shores and reefs, seagrass beds, salt marshes, mangroves, and sandy or muddy bottom areas in estuaries, coastal lagoons and the ocean.

5.4.2 NSW Fisheries Management Act

Bilambil Creek, just below the subject site, may provide potential habitat for three species listed under the Fisheries Management Act:

1. Oxleyan Pygmy Perch (vulnerable)
2. Green Sawfish (presumed extinct); and
3. Black Cod (vulnerable)

5.4.3 Assessment of Significance

An assessment of significance (7 point test) will be undertaken for the above three listed species.

5.4.3.1 Sawfish (*Pristis zijsron*)

Extent of the local population

The last confirmed sighting of the green sawfish, in NSW, was in 1972 from the Clarence River at Yamba (DPI 2005). TSC records indicate that Bilambil Creek, just below the subject site, provides potential habitat for this species.

Stages of the life-cycle affected by the proposed development

The Green sawfish live on Muddy or sandy-mud soft bottom habitats in inshore areas. They also enter estuaries, where they have been found in very shallow waters (DPI 2005). They feed on slow-moving, shoaling fish such as mullet, which they stun with sideswipes of the snout and are also thought to use their saw to sweep other prey, such as molluscs and small crustaceans, out of the sand and mud.

Likelihood of local extinction

The proposed development will not have a negative affect on the potential habitat of the Green sawfish. The planned revegetation of the Riparian buffer zone with Lowland rainforest species will improve the Riparian Zone, bank stability and water quality of Bilambil Creek adjacent the proposed development. It is unlikely that the proposed development will cause the local extinction of the Green sawfish.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Thirty-three (33) endangered populations have been identified under the TSC Act. The following four (4) endangered populations occur in north-eastern NSW:



- Long-nosed potoroo population, Cobaki Lakes and Tweed Heads West;
- Emu population in the NSW North Coast Bioregion and Port Stephens LGA;
- Low growing form of *Zieria smithii*, Diggers Head; and
- *Glycine clandestina* (Broad-leaf form) in the Nambucca LGA.

The proposed action will not have an adverse affect on any of these endangered populations.

(c) In the case of an endangered ecological community or critically endangered ecological community whether the action proposed:

- (iii) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (iv) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable

(d) In relation to the habitat of a threatened species, population or ecological community:

- (iv) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- (v) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (vi) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Response (i)

The potential habitat for the Green sawfish will be unaffected by the proposed development

Response (ii)

No areas of habitat will become fragmented or isolated from other areas of habitat as a result of the proposed development.

Response (iii)

The potential habitat for the Green sawfish will be unaffected by the proposed development.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Critical habitat areas listed under the Threatened Species Conservation Act (1995) currently consist only of habitat for:



- Mitchell's Rainforest Snail in Stotts Island Nature Reserve - critical habitat declaration
- Little penguin population in Sydney's North Harbour - critical habitat declaration
- Wollemi Pine - critical habitat declaration
- Gould's Petrel - critical habitat declaration

There will be no adverse effects on these critical habitats from the action proposed.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

An Approved recovery plan has not been completed for the threatened species considered a possible occurrence at this site.

To date, only two Threat abatement plans have been approved:

- Predation by the Red fox
- Invasion by the Plague minnow

Neither of these invasive species are likely to have a significant impact on fauna on the Subject Site.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

A “threatening process” means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of a species, population or ecological community. Key Threatening Processes have been listed in Schedule 3 of the *TSC Act (1995)* and are shown in **APPENDIX 2**.

The Proposed development will contribute towards the clearing of native vegetation, a key threatening process listed on Schedule 3 of the *TSC Act (1995)*. The final determination of the NSW Scientific Committee notes that clearing of native vegetation is recognised as a major factor contributing to loss of biological diversity, with impacts such as: destruction of habitat; fragmentation of habitat; riparian zone degradation; increased greenhouse gas emissions; increased habitat for invasive species; loss of leaf litter layer; loss or disruption of ecological function (e.g. loss of populations of pollinators or seed dispersers) and changes to soil biota.

The amount of native vegetation to be cleared is minor. Amelioration measures have been recommended to compensate for the loss of vegetation on the Subject Site.

The Proposed development is unlikely to result in the operation of, or increase the impact of, these additional key threatening process, including:

- Introduction of the Cane toad, *Bufo marinus*;
- Invasion of the yellow crazy ant;
- Entanglement in, or digestion of anthropogenic debris in marine and estuarine environments;
- Removal of dead wood and dead trees;



- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- Bushrock removal;
- Ecological consequences of high frequency fires;
- Human-caused climate change;
- Loss and/or degradation of sites used for hilltopping by butterflies;
- Predation by the European red fox;
- Predation by feral cats;
- Importation of red imported fire ants into NSW; and
- Competition and grazing by the feral European rabbit.

On the basis of this assessment, it is considered that a Species Impact Statement (SIS) is not required.

5.4.3.2 Oxleyan Pygmy Perch (*Nannoperca oxleyana*)

Extent of the local population

TSC records indicate that Bilambil Creek, just below the subject site, provides potential habitat for this species.

Stages of the life-cycle affected by the proposed development

Oxleyan pygmy perch have a restricted and patchy distribution in the coastal lowlands from north-eastern NSW to south-eastern QLD including Fraser, Moreton and Stradbroke Islands (DPI 2005). They mostly occur in swamps, creeks and lakes of the coastal “wallum” vegetation. These waters are usually acidic, with low salinity and low conductivity, and are often darkly stained (DPI 2005).

Likelihood of local extinction

The proposed development will not have a negative affect on the potential habitat of the Oxleyan Pygmy Perch. The planned revegetation of the Riparian buffer zone with Lowland rainforest species will improve the Riparian Zone, bank stability and water quality of Bilambil Creek adjacent the proposed development. It is unlikely that the proposed development will cause the local extinction of the Oxleyan Pygmy Perch.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Thirty-three (33) endangered populations have been identified under the *TSC Act*. The following four (4) endangered populations occur in north-eastern NSW:

- Long-nosed potoroo population, Cobaki Lakes and Tweed Heads West;
- Emu population in the NSW North Coast Bioregion and Port Stephens LGA;
- Low growing form of *Zieria smithii*, Diggers Head; and
- *Glycine clandestina* (Broad-leaf form) in the Nambucca LGA.

The proposed action will not have an adverse affect on any of these endangered populations.

(c) In the case of an endangered ecological community or critically endangered ecological community whether the action proposed:



- (v) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (vi) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable

(d) In relation to the habitat of a threatened species, population or ecological community:

- (vii) *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- (viii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (ix) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Response (i)

The potential habitat for the Oxleyan Pygmy Perch will be unaffected by the proposed development

Response (ii)

No areas of habitat will become fragmented or isolated from other areas of habitat as a result of the proposed development.

Response (iii)

The potential habitat for the Oxleyan Pygmy Perch will be unaffected by the proposed development.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Critical habitat areas listed under the Threatened Species Conservation Act (1995) currently consist only of habitat for:

- Mitchell's Rainforest Snail in Stotts Island Nature Reserve - critical habitat declaration
- Little penguin population in Sydney's North Harbour - critical habitat declaration
- Wollemi Pine - critical habitat declaration
- Gould's Petrel - critical habitat declaration

There will be no adverse effects on these critical habitats from the action proposed.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.



Recovery

A recovery plan has been developed for the Oxleyan Pygmy Perch and work on recovery actions is well underway. The status of the Oxleyan Pygmy Perch has been revised from 'endangered' to 'venerable' within 15 years indicating the success of the recovery plan. The proposed development and accompanying Vegetation Rehabilitation Plan (JWA 2009) are consistent with the overall recovery objectives of the Oxleyan Pygmy Perch Recovery Plan.

Threat abatement

To date, only two Threat abatement plans have been approved:

- Predation by the Red fox
- Invasion by the Plague minnow

The Plague minnow is listed as a threat to the Oxleyan Pygmy Perch. The proposed development is unlikely to increase the threat level of the invasive Plague minnow on the Oxleyan Pygmy Perch.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

A "threatening process" means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of a species, population or ecological community. Key Threatening Processes have been listed in Schedule 3 of the *TSC Act (1995)* and are shown in **APPENDIX 2**.

The Proposed development will contribute towards the clearing of native vegetation, a key threatening process listed on Schedule 3 of the *TSC Act (1995)*. The final determination of the NSW Scientific Committee notes that clearing of native vegetation is recognised as a major factor contributing to loss of biological diversity, with impacts such as: destruction of habitat; fragmentation of habitat; riparian zone degradation; increased greenhouse gas emissions; increased habitat for invasive species; loss of leaf litter layer; loss or disruption of ecological function (e.g. loss of populations of pollinators or seed dispersers) and changes to soil biota.

The amount of native vegetation to be cleared is minor. Amelioration measures have been recommended to compensate for the loss of vegetation on the Subject Site.

The Proposed development is unlikely to result in the operation of, or increase the impact of, these additional key threatening process, including:

- Introduction of the Cane toad, *Bufo marinus*;
- Invasion of the yellow crazy ant;
- Entanglement in, or digestion of anthropogenic debris in marine and estuarine environments;
- Removal of dead wood and dead trees;
- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- Bushrock removal;
- Ecological consequences of high frequency fires;
- Human-caused climate change;



- Loss and/or degradation of sites used for hilltopping by butterflies;
- Predation by the European red fox;
- Predation by feral cats;
- Importation of red imported fire ants into NSW; and
- Competition and grazing by the feral European rabbit.

On the basis of this assessment, it is considered that a Species Impact Statement (SIS) is not required.

5.4.3.3 Black Cod

Extent of the local population

TSC records indicate that Bilambil Creek, just below the subject site, provides potential habitat for this species.

Stages of the life-cycle affected by the proposed development

The adult black cod are usually found in caves, gutter and beneath bommies on rocky reefs. They are territorial and often occupy a particular cave for life. Small juveniles are often found in coastal rock pools and larger juveniles around rocky shores in estuaries. Black cod are opportunistic carnivores, eating mainly other fish and crustaceans.

Likelihood of local extinction

The proposed development will not have a negative affect on the potential habitat of the Black cod. The planned revegetation of the Riparian buffer zone with Lowland rainforest species will improve the Riparian Zone and water quality of Bilambil Creek adjacent the proposed development. It is unlikely that the proposed development will cause the local extinction of the Green sawfish.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Thirty-three (33) endangered populations have been identified under the TSC Act. The following four (4) endangered populations occur in north-eastern NSW:

- Long-nosed potoroo population, Cobaki Lakes and Tweed Heads West;
- Emu population in the NSW North Coast Bioregion and Port Stephens LGA;
- Low growing form of *Zieria smithii*, Diggers Head; and
- *Glycine clandestina* (Broad-leaf form) in the Nambucca LGA.

The proposed action will not have an adverse affect on any of these endangered populations.

(c) In the case of an endangered ecological community or critically endangered ecological community whether the action proposed:

- (vii) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*



- (viii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable

(d) In relation to the habitat of a threatened species, population or ecological community:

- (x) *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- (xi) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (xii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Response (i)

The potential habitat for the Black cod will be unaffected by the proposed development

Response (ii)

No areas of habitat will become fragmented or isolated from other areas of habitat as a result of the proposed development.

Response (iii)

The potential habitat for the Black cod will be unaffected by the proposed development.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Critical habitat areas listed under the Threatened Species Conservation Act (1995) currently consist only of habitat for:

- Mitchell's Rainforest Snail in Stotts Island Nature Reserve - critical habitat declaration
- Little penguin population in Sydney's North Harbour - critical habitat declaration
- Wollemi Pine - critical habitat declaration
- Gould's Petrel - critical habitat declaration

There will be no adverse effects on these critical habitats from the action proposed.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

An Approved recovery plan has not been completed for the threatened species considered a possible occurrence at this site.

To date, only two Threat abatement plans have been approved:



- Predation by the Red fox
- Invasion by the Plague minnow

Neither of these invasive species are likely to have a significant impact on fauna on the Subject Site.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

A “threatening process” means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of a species, population or ecological community. Key Threatening Processes have been listed in Schedule 3 of the *TSC Act (1995)* and are shown in **APPENDIX 2**.

The Proposed development will contribute towards the clearing of native vegetation, a key threatening process listed on Schedule 3 of the *TSC Act (1995)*. The final determination of the NSW Scientific Committee notes that clearing of native vegetation is recognised as a major factor contributing to loss of biological diversity, with impacts such as: destruction of habitat; fragmentation of habitat; riparian zone degradation; increased greenhouse gas emissions; increased habitat for invasive species; loss of leaf litter layer; loss or disruption of ecological function (e.g. loss of populations of pollinators or seed dispersers) and changes to soil biota.

The amount of native vegetation to be cleared is minor. Amelioration measures have been recommended to compensate for the loss of vegetation on the Subject Site.

The Proposed development is unlikely to result in the operation of, or increase the impact of, these additional key threatening process, including:

- Introduction of the Cane toad, *Bufo marinus*;
- Invasion of the yellow crazy ant;
- Entanglement in, or digestion of anthropogenic debris in marine and estuarine environments;
- Removal of dead wood and dead trees;
- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- Bushrock removal;
- Ecological consequences of high frequency fires;
- Human-caused climate change;
- Loss and/or degradation of sites used for hilltopping by butterflies;
- Predation by the European red fox;
- Predation by feral cats;
- Importation of red imported fire ants into NSW; and
- Competition and grazing by the feral European rabbit.

On the basis of this assessment, it is considered that a Species Impact Statement (SIS) is not required.



5.5 Commonwealth Environmental Protection and Biodiversity Conservation Act (1999)

5.5.1 Introduction

The *Environment Protection & Biodiversity Conservation (EPBC) Act (1999)* was passed by Commonwealth Parliament in June 1999 and came into force on 16 July, 2000. A person must not, without an approval under the Act, take an action that has or will have, or is likely to have, a significant impact on a matter of National Environmental Significance (NES). These matters are listed as:

- (a) the world heritage values of a declared World Heritage property;
- (b) the ecological character of a declared Ramsar wetland;
- (c) a threatened species or endangered community listed under the Act;
- (d) a migratory species listed under the Act; or
- (e) the environment in a Commonwealth marine area or on Commonwealth land.

The Act also prohibits the taking, without an approval under the Act, of:

- (a) a nuclear action; or
- (b) an action in a Commonwealth marine area or on Commonwealth land that has or will have, or is likely to have, a significant impact on the environment.

An action includes a project, development, undertaking or an activity or series of activities. An action does not require approval if it is a lawful continuation of a use of land, sea or seabed that was occurring before the commencement of the Act. An enlargement, expansion or intensification of a use is not a continuation of a use.

The *EPBC Act (1999)* does not require Commonwealth approval for the rezoning of land. It does, however, suggest that when rezoning land, planning authorities should consider whether to allow actions that could significantly affect NES matters or the environment of Commonwealth land.

Matters of NES in NSW are:

- (a) Declared World Heritage Areas;
- (b) Declared Ramsar Wetlands;
- (c) Listed Threatened Species (Schedule 1 and 2 of Commonwealth Endangered Species Protection Act 1992);
- (d) Listed Ecological Communities in Queensland; and
- (e) Listed migratory species (JAMBA and CAMBA).



5.5.2 Occurrence of Matter of NES on Subject Site

5.5.2.1 Background

A Commonwealth Assessment will be required for proposed activities on the Subject Site if they affect a matter of NES. Matters of NES in NSW were identified in the previous section. There are no declared World Heritage Areas or Ramsar Wetlands in the locality, study area or Subject Site.

5.5.2.2 Listed Threatened Species

One (1) Commonwealth Threatened flora species Rough-shelled bush nut (*Macadamia tetraphylla*) was recorded on the Subject Site.

One (1) Commonwealth Threatened fauna species, the Grey-headed flying-fox (*Pteropus poliocephalus*) is considered as a possible occurrence on the Subject Site.

5.5.2.3 Listed Ecological Communities

None of the ecological communities currently listed in the *EPBC Act (1999)* occur in the study area or wider locality.

5.5.2.4 Listed Migratory Species

Listed migratory species in Queensland are considered predominantly in the Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA).

5.5.3 Assessment against EPBC Act Principal Significant Impact Guidelines

5.5.3.1 5.4.3.1 Background

The Commonwealth DEH has prepared EPBC Act Policy Statements, including the EPBC Act - Principal Significant Impact Guidelines 1.1 (2005) which outline a self-assessment process to assist in determining whether an action should be referred to the Department for a decision on whether assessment and approval is required under the Act. The following sections assess the Proposed development (the action) against these guidelines.

5.5.3.2 Critically Endangered and Endangered Species

Significant Impact Criteria

An action has, will have, or is likely to have a significant impact on a critically endangered or endangered species if it does, will, or is likely to:

- lead to a long-term decrease in the size of a population; or
- reduce the area of occupancy of the species; or
- fragment an existing population into two or more populations; or
- adversely affect habitat critical to the survival of a species; or
- disrupt the breeding cycle of a population; or



- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; or
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat; or
- interfere with the recovery of the species.

Assessment of Proposed Action

The Subject Site does contain habitat for populations of Endangered species listed in the *EPBC Act (1999)* however, a significant impact on such species will not be incurred.

5.5.3.3 Vulnerable Species

Significant Impact Criteria

An action has, will have, or is likely to have a significant impact on a vulnerable species if it does, will, or is likely to:

- lead to a long-term decrease in the size of an important population of a species; or
- reduce the area of occupancy of an important population; or
- fragment an existing important population into two or more populations; or
- adversely affect habitat critical to the survival of a species; or
- disrupt the breeding cycle of an important population; or
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; or
- result in invasive species that are harmful a vulnerable species becoming established in the vulnerable species' habitat; or
- interferes substantially with the recovery of the species.

An important population is one that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal;
- populations that are necessary for maintaining genetic diversity; and/or
- populations that are near the limit of the species range.

Assessment of Proposed Action

The Subject Site does contain habitat for populations of Vulnerable species listed in the *EPBC Act (1999)* however, a significant impact on such species will not be incurred.

5.5.3.4 Migratory Species

Significant Impact Criteria

An action has, will have, or is likely to have a significant impact on a migratory species if it does, will, or is likely to:



- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species; or
- result in invasive species that is harmful to the migratory species becoming established* in an area of important habitat of the migratory species; or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

(* Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a migratory species by direct competition, modification of habitat, or predation.)

An area of important habitat is:

1. habitat utilised by a migratory species occasionally or periodically within a region that supports an *ecologically significant proportion* of the population of the species, or
2. habitat utilised by a migratory species which is at the limit of the species range, or
3. habitat within an area where the species is declining.

Assessment of Proposed Action

A number of listed migratory species are known or likely to occur occasionally in the study area. The Proposed development will not remove, or damage important habitat for these species.

5.5.3.5 Wetlands of International Importance

Significant Impact Criteria

An action is likely to have a significant impact on the ecological character of a declared Ramsar wetland if there is a real chance or possibility that it will result in:

- areas of the wetland being destroyed or substantially modified, or
- a substantial and measurable change in the hydrological regime of the wetland for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland, or
- the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependant upon the wetland being seriously affected, or
- a substantial and measurable change in the water quality of the wetland for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health, or
- an invasive species that is harmful to the ecological character of the wetland being established in the wetland.

Assessment of Proposed Action

No Wetlands of International Importance occur in the locality of the Subject Site.



5.5.3.6 Requirement for Commonwealth Referral

Based on the assessment provided above, Referral to the Commonwealth DEH is not required. The proposed action is unlikely to result in a significant impact on any matter of NES.

5.5.4 *Requirement for Commonwealth Assessment*

On the basis of the above assessment, it is concluded that Commonwealth Assessment is not required for the Proposed development of the Subject Site.



6 SUMMARY AND CONCLUSIONS

James Warren and Associates (JWA) have been engaged by Plateau Nominees Pty Limited to complete a Flora and Fauna Assessment for land at Lots 2 & 3 DP 244652, Urliup Road, Bilambil.

The Subject Site was previously used as a quarry resulting in an area that is highly disturbed and infested with exotic weeds. The riparian area of Bilambil Creek is dominated by Camphor laurel but some elements of riparian rainforest vegetation remain.

The Proposed development consists of 52 residential Lots, a commercial development, open space, drainage reserves and roads. Residential Lots will comprise the majority of the site, while open and commercial space, and roads will make up the balance of the property.

Five (5) vegetation communities and ninety-five (95) flora species were recorded with the majority of flora being exotic weeds. One (1) threatened flora species was recorded. The Rough-shelled bush nut (*Macadamia tetraphylla*) is listed as Vulnerable under the TSC 1974 and the EPBC 1999. The Proposed development layout will result in the loss of one (1) stem of the threatened flora, Rough-shelled bush nut (*Macadamia tetraphylla*). Amelioration measures will ensure adequate protection of this specimen, as it will be translocated to the park in the south east of the site in accordance with a Translocation Plan (JWA 2009a). The potential impact, from the Proposed development, on the threatened flora is therefore not considered to be significant and a Species Impact Statement is not required.

A fauna survey and habitat assessment was carried out in conjunction with the flora survey. Due to the highly disturbed nature of this site, the suitability for native fauna occurring is greatly reduced. One (1) amphibian, twenty-one (21) bird species and no mammals or reptiles were recorded. An assessment of available habitat concluded that 10 locally occurring threatened species may possibly occur on the site at times. The potential impact, from the Proposed development, on the threatened fauna is not considered to be significant and a Species Impact Statement is not required.

In total 3.7 hectares of vegetation will be lost from the Subject Site. The majority of the vegetation to be lost is a Low Closed Herbland containing mostly exotic weeds. The Proposed development will enhance the natural environment with the implementation of a Vegetation Rehabilitation Plan focusing on the Riparian Zone of Bilambil Creek (JWA 2009b). The project will restore a 25m strip along Bilambil Creek to Sub-tropical Riparian Rainforest and a further 10m will be planted with low growing native shrubs, ground covers and occasional trees. A road (approximately 15m) will separate this vegetation from the residential blocks, providing a 50m buffer to Bilambil Creek.

A Koala Habitat assessment of the site under SEPP 44 (Koala Habitat Protection) concluded that the Subject site does not comprise core Koala habitat, and a Koala Plan of Management is not required.



Flora and Fauna Assessment

An assessment under the Commonwealth Environment Protection and Biodiversity Conservation Act (1999) concluded that the Proposed development will not have a significant impact on any matters of National Environmental Significance. Commonwealth assessment of the proposal is not required.



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APPENDIX 1 PLANT SPECIES LIST

Grouping	Family	Botanical Name	Common Name
Ferns and Fern Allies	Adiantaceae	<i>Adiantum hispidulum</i>	Rough maidenhair
Ferns and Fern Allies	Aspleniaceae	<i>Asplenium Australasicum</i>	Bird's nest fern
Ferns and Fern Allies	Cyatheaceae	<i>Cyathea</i> sp.	Tree fern
Ferns and Fern Allies	Davalliaceae	<i>Nephrolepis cordifolia</i> *	Fishbone fern
Ferns and Fern Allies	Dennstaedtiaceae	<i>Pteridium esculentum</i>	Bracken fern
Ferns and Fern Allies	Thelypteridaceae	<i>Christella dentata</i>	Binung
Gymnosperms	Pinaceae	<i>Pinus elliottii</i> *	Slash pine
Monocotyledons	Araceae	<i>Alocasia brisbanensis</i>	Cunjevoi
Monocotyledons	Araceae	<i>Syngonium podophyllum</i>	Arrowhead
Monocotyledons	Arecaceae	<i>Archontophoenix cunninghamiana</i>	Bangalow palm
Monocotyledons	Arecaceae	<i>Syagrus romanzoffiana</i> *	Cocos palm
Monocotyledons	Asparagaceae	<i>Asparagus aethiopicus</i> *	Asparagus fern
Monocotyledons	Asparagaceae	<i>Asparagus plumosus</i> *	Climbing asparagus fern
Monocotyledons	Commelinaceae	<i>Commelina benghalensis</i> *	Hairy wandering jew
Monocotyledons	Commelinaceae	<i>Tradescantia fluminensis</i> *	Wandering jew
Monocotyledons	Cyperaceae	<i>Cyperus polystachyos</i> var <i>polystachyos</i>	Bunchy sedge
Monocotyledons	Flagellariaceae	<i>Flagellaria indica</i>	Whip vine
Monocotyledons	Lomandraceae	<i>Lomandra hystrix</i>	Stream matrush
Monocotyledons	Lomandraceae	<i>Lomandra longifolia</i>	Long-leaved matrush/ Spiny-headed matrush
Monocotyledons	Phormiaceae	<i>Dianella caerulea</i>	Blue flax lily
Monocotyledons	Poaceae	<i>Melinis minutiflora</i> *	Molasses grass
Monocotyledons	Poaceae	<i>Oplismenus aemulus</i>	Basket grass
Monocotyledons	Poaceae	<i>Ottocloa gracillima</i>	Shade grass
Monocotyledons	Poaceae	<i>Paspalum dilatatum</i> *	Paspalum
Monocotyledons	Poaceae	<i>Paspalum wettsteinii</i> *	Broad-leaved paspalum
Monocotyledons	Poaceae	<i>Pennisetum alopecuroides</i>	Swamp foxtail
Monocotyledons	Poaceae	<i>Pennisetum purpureum</i>	Elephant grass
Monocotyledons	Poaceae	<i>Setaria</i> sp.*	Pigeon grass
Monocotyledons	Poaceae	<i>Setaria sphacelata</i> *	Pigeon grass
Monocotyledons	Poaceae	<i>Sporobolus africanus</i> *	Parramatta grass



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Grouping	Family	Botanical Name	Common Name
Monocotyledons	Poaceae	<i>Sporobolus indicus</i> var. <i>indicus</i> *	Rat's tail grass
Dicotyledons	Apocynaceae	<i>Parsonsia straminea</i>	Common silkpod
Dicotyledons	Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella tree
Dicotyledons	Aristolochiaceae	<i>Aristolochia elegans</i> *	Dutchman's pipe
Dicotyledons	Asclepiadaceae	<i>Araujia sericifera</i> *	Moth plant
Dicotyledons	Asclepiadaceae	<i>Asclepias curassavica</i> *	Redhead cotton bush
Dicotyledons	Asclepiadaceae	<i>Gomphocarpus fruticosus</i> *	Narrow- leafed cotton bush
Dicotyledons	Asclepiadaceae	<i>Gomphocarpus physocarpus</i> *	Balloon cotton bush
Dicotyledons	Asteraceae	<i>Ageratina adenophora</i> *	Crofton weed
Dicotyledons	Asteraceae	<i>Ageratina riparia</i> *	Mistflower
Dicotyledons	Asteraceae	<i>Ageratum houstonianum</i> *	Blue billygoat weed
Dicotyledons	Asteraceae	<i>Ambrosia artemisiifolia</i> *	Annual ragweed
Dicotyledons	Asteraceae	<i>Aster subulatus</i>	Wild aster
Dicotyledons	Asteraceae	<i>Baccharis halimifolia</i> *	Groundsel
Dicotyledons	Asteraceae	<i>Bidens pilosa</i> *	Cobblers pegs
Dicotyledons	Asteraceae	<i>Carduus</i> sp.*	Milk thistle
Dicotyledons	Asteraceae	<i>Erechtites valerianifolia</i> *	Brazilian fire weed
Dicotyledons	Asteraceae	<i>Hypochoeris radicata</i> *	Flatweed
Dicotyledons	Asteraceae	<i>Onopordium acanthum</i> *	Scotch Thistle
Dicotyledons	Asteraceae	<i>Tagetes minuta</i> *	Stinking roger
Dicotyledons	Asteraceae	<i>Taraxacum officinale</i> *	Dandelion
Dicotyledons	Asteraceae	<i>Tithonia diversifolia</i> *	Japanese sunflower
Dicotyledons	Asteraceae	<i>Tridax procumbens</i>	Tridax
Dicotyledons	Asteraceae	<i>Wedelia trilobata</i> *	Singapore daisy
Dicotyledons	Asteraceae	<i>Xanthium occidentale</i> *	Noogoora burr
Dicotyledons	Basellaceae	<i>Anredera cordifolia</i> *	Madeira vine
Dicotyledons	Bignoniaceae	<i>Jacaranda mimosifolia</i> *	Jacaranda
Dicotyledons	Caesalpiniaceae	<i>Caesalpinia subtropica</i>	Corky prickly vine
Dicotyledons	Caesalpiniaceae	<i>Senna pendula</i> var. <i>glabrata</i> *	Winter senna
Dicotyledons	Caesalpiniaceae	<i>Senna X floribunda</i> *	Smooth senna
Dicotyledons	Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory
Dicotyledons	Convolvulaceae	<i>Ipomoea indica</i> *	Morning glory
Dicotyledons	Elaeocarpaceae	<i>Elaeocarpus grandis</i>	Blue quandong
Dicotyledons	Elaeocarpaceae	<i>Elaeocarpus obovatus</i>	Hard quandong
Dicotyledons	Euphorbiaceae	<i>Macaranga tanarius</i>	Macaranga
Dicotyledons	Euphorbiaceae	<i>Mallotus philippensis</i>	Red kamala
Dicotyledons	Euphorbiaceae	<i>Ricinus communis</i> *	Castor oil plant
Dicotyledons	Fabaceae	<i>Crotalaria lanceolata</i> *	Rattlepod
Dicotyledons	Fabaceae	<i>Desmodium intortum</i> *	Green-leaved desmodium
Dicotyledons	Fabaceae	<i>Desmodium uncinatum</i> *	Silver-leaved desmodium
Dicotyledons	Fabaceae	<i>Erythrina crista-galli</i> *	Cockspur coral tree
Dicotyledons	Lauraceae	<i>Cinnamomum camphora</i> *	Camphor laurel



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Grouping	Family	Botanical Name	Common Name
Dicotyledons	Meliaceae	<i>Dysoxylum mollissimum</i> ssp. <i>Molle</i>	Red bean
SDicotyledons	Mimosaceae	<i>Acacia disparrima</i>	Brush ironbark wattle
Dicotyledons	Mimosaceae	<i>Acacia longissima</i>	Narrow leaf acacia
Dicotyledons	Mimosaceae	<i>Acacia melanoxylon</i>	Blackwood wattle
Dicotyledons	Moraceae	<i>Ficus coronata</i>	Creek sandpaper fig
Dicotyledons	Moraceae	<i>Ficus virens</i>	White fig
Dicotyledons	Myrtaceae	<i>Eugenia uniflora</i> *	Brazilian cherry
Dicotyledons	Myrtaceae	<i>Psidium guajava</i> *	Yellow guava
Dicotyledons	Myrtaceae	<i>Syzygium australe</i>	Brush cherry
Dicotyledons	Myrtaceae	<i>Waterhousea floribunda</i>	Weeping lilly pilly
Dicotyledons	Ochnaceae	<i>Ochna serrulata</i> *	Mickey mouse plant
Dicotyledons	Oleaceae	<i>Ligustrum lucidum</i> *	Large-leaved privet
Dicotyledons	Pittosporaceae	<i>Pittosporum revolutum</i>	Hairy pittosporum
Dicotyledons	Pittosporaceae	<i>Pittosporum undulatum</i>	Sweet pittosporum
Dicotyledons	Proteaceae	<i>Macadamia tetraphylla</i>	Rough-shelled bush nut
Dicotyledons	Sapindaceae	<i>Cupaniopsis anacardioides</i>	Tuckeroo
Dicotyledons	Sapindaceae	<i>Guioa semiglauca</i>	Guioa
Dicotyledons	Sapindaceae	<i>Jagera pseudorhus</i>	Foambark
Dicotyledons	Sterculiaceae	<i>Commersonia bartramia</i>	Brown kurrajong
Dicotyledons	Tiliaceae	<i>Triumfetta rhomboidea</i> *	Chinese burr
Dicotyledons	Ulmaceae	<i>Celtis sinensis</i> *	Chinese celtis
Dicotyledons	Verbenaceae	<i>Lantana camara</i> *	Lantana
Dicotyledons	Verbenaceae	<i>Verbena bonariensis</i> *	Purple top

* Introduced Species

Threatened species are shown in bold



APPENDIX 2

Key Threatening Processes

Key Threatening Processes (Listed under *Schedule 3* of the *Threatened Species Conservation Act 1995*):

- Invasion of native plant communities by Lantana (*Lantana camara*)
- Invasion of native plant communities by Exotic vines and scramblers;
- Introduction of the Cane toad, *Bufo marinus*;
- Invasion of the yellow crazy ant;
- Feral pigs;
- Competition and habitat destruction by feral goats;
- Entanglement in, or digestion of anthropogenic debris in marine and estuarine environments;
- Introduction of the large earth Bumble bee, *Bombus terrestris*;
- Removal of dead wood and dead trees;
- Death or injury to marine species following capture in shark control programs on ocean beaches;
- Invasion of native plant communities by exotic perennial grasses;
- Infection of frogs by amphibian chytrid, causing the disease chytridiomycosis
- Competition from feral honeybees;
- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- Clearing of native vegetation;
- Bushrock removal;
- Ecological consequences of high frequency fires;
- Human-caused climate change;
- Invasion of native plant communities by Bitou Bush and Boneseed;
- Loss and/or degradation of sites used for hilltopping by butterflies;
- Predation by the European red fox;
- Predation by feral cats;
- Predation by the ship rat on Lord Howe Island;
- Predation by the Plague minnow (*Gambusia holbrooki*);
- Infection of native plants by *Phytophthora cinnamomi*;
- Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations;
- Importation of red imported fire ants into NSW; and
- Competition and grazing by the feral European rabbit.